DIRECTORATE OF URBAN LAND TRANSPORT & BMLTA

URBAN DEVELOPMENT DEPARTMENT (UDD)

Government of Karnataka

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ಕಾರ್ಯಾಗಾರ - ಬೆಂಗಳೂರು

26TH FEB 2010

National Workshop on Bus Rapid Transit - Bengaluru

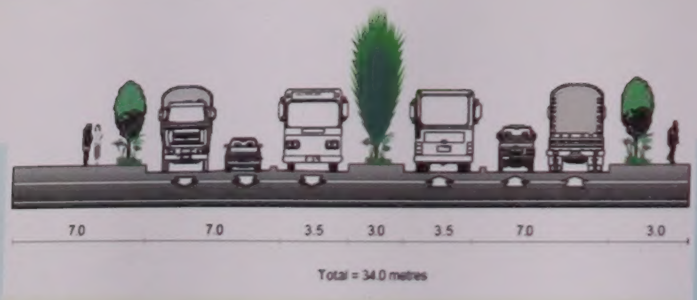
Organised by

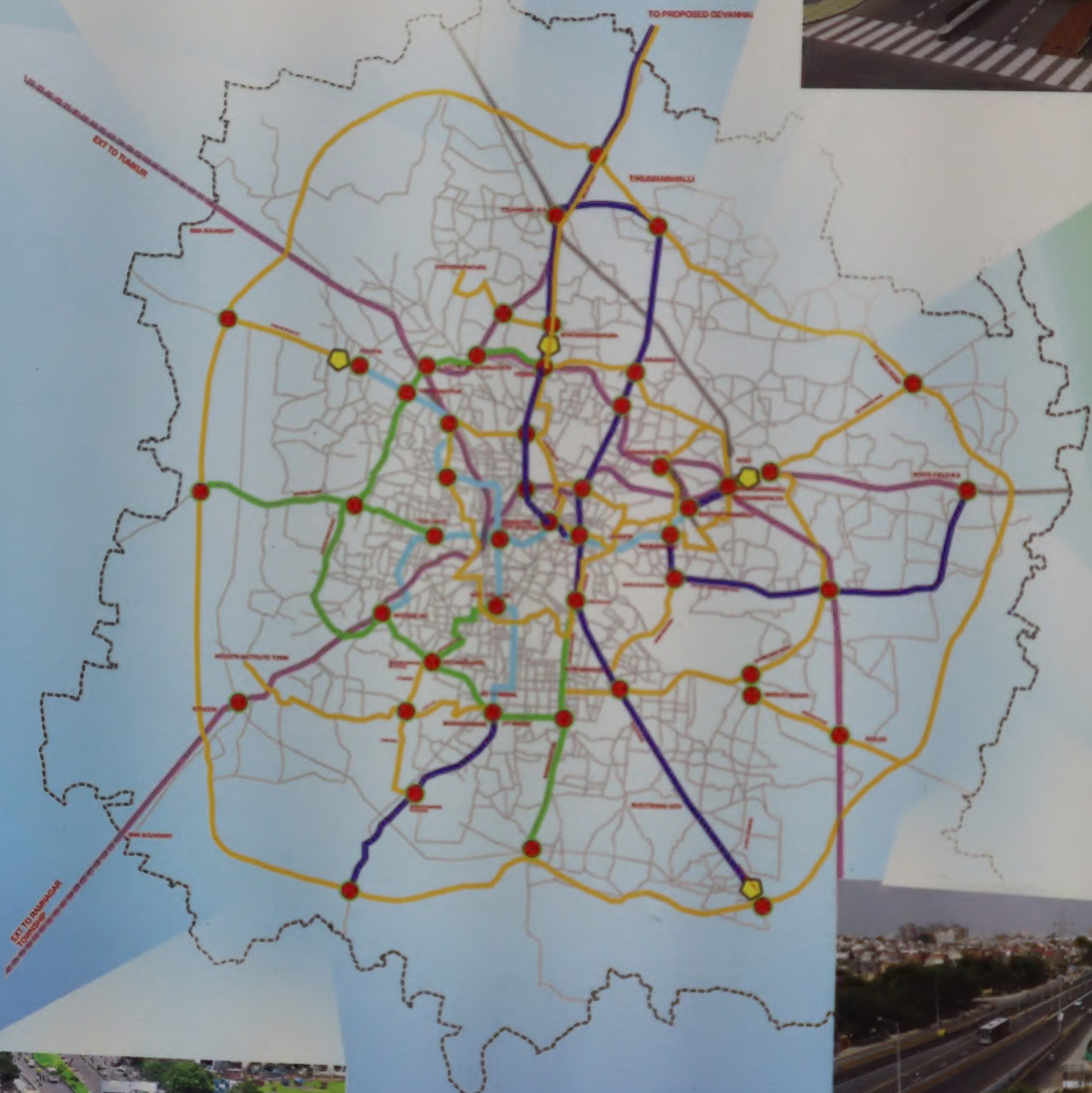
BMLTA Bangalore Metropolitan Land Transport Authority

KSRTC

Institute of Urban Transport (India)

gtz





LEGEND

▬	METRO PHASE 1
▬	METRO PHASE 2 & 3
▬	MONO RAIL / LRT SYSTEM
▬	BRT SYSTEM
▬	COMMUTER RAIL
●	INTERCHANGE POINT
⬠	INTER-MODAL TRANSIT CENTRE -CUM- INTER CITY BUS TERMINAL

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ABBREVATIONS

BDA- Bangalore Development Authority

BMTC- Bangalore Metropolitan Transport Corporation

BMLTA- Bangalore Metropolitan Regional Development Authority

BMRCL- Bangalore Metro Rail Corporation Limited

BRTS- Bus Rapid Transit System

CMP- Comprehensive Mobility Plan

DULT- Directorate of Urban Land Transport

GOI- Government of India

GOK- Government of Karnataka

IUT- Institute of Urban Transport

KSRTC- Karnataka State Road Transport Corporation

MRTS- Mass Rapid Transit Corporation

NUTP- National Urban Transport Policy

UMTC- Urban Mass Transit Corporation

UMTA- Unified Metropolitan Transport Authority

1. Executive Summary

Bangalore and surrounding cities are intending to implement a Bus Rapid Transit (BRT) and in order to sensitise the officials on the importance of having BRT as a mass transit system the following workshop was conducted. This report will summarise the various organisations that were involved in this one day workshop and the results obtained from the evaluations turned-in by the participants of the workshop.

The objective of workshop is to promote awareness among the various stakeholders in Karnataka and also to provide the technical awareness to the engineers and planners involved in the BRT planning. The workshop also aims to address the issues of marketing the BRT among various stakeholders and integration of the other urban transport modes with the BRT system.

2. Organisations Involved and their Contributions

Directorate of Urban Land Transport (DULT) & Bangalore Metropolitan Land Transport Authority (BMLTA) was instrumental at providing local support for the event and has sponsored the entire course and local logistics. Further, DULT was also responsible for inviting high level dignitaries such as the Principal Secretary and the Chief Secretary from the government of Karnataka, who formally opened and closed the training course respectively. Mr. Mohammed Mohsin, Director, DULT was the key person who was instrumental in mobilising the entire workshop.

GTZ-SUTP was the organizing institution under its Sustainable Urban Transport Project (SUTP). It was in charge of developing the concept for the course and for arranging logistical issues to develop the training course.

Institute of Urban Transport (IUT) supported the event by disseminating the training course and provided logistical support.

Karnataka State Road Transport Corporation (KSRTC) co-sponsored the workshop.

Bangalore Metropolitan Transport Corporation (BMTC) also co-sponsored the workshop.

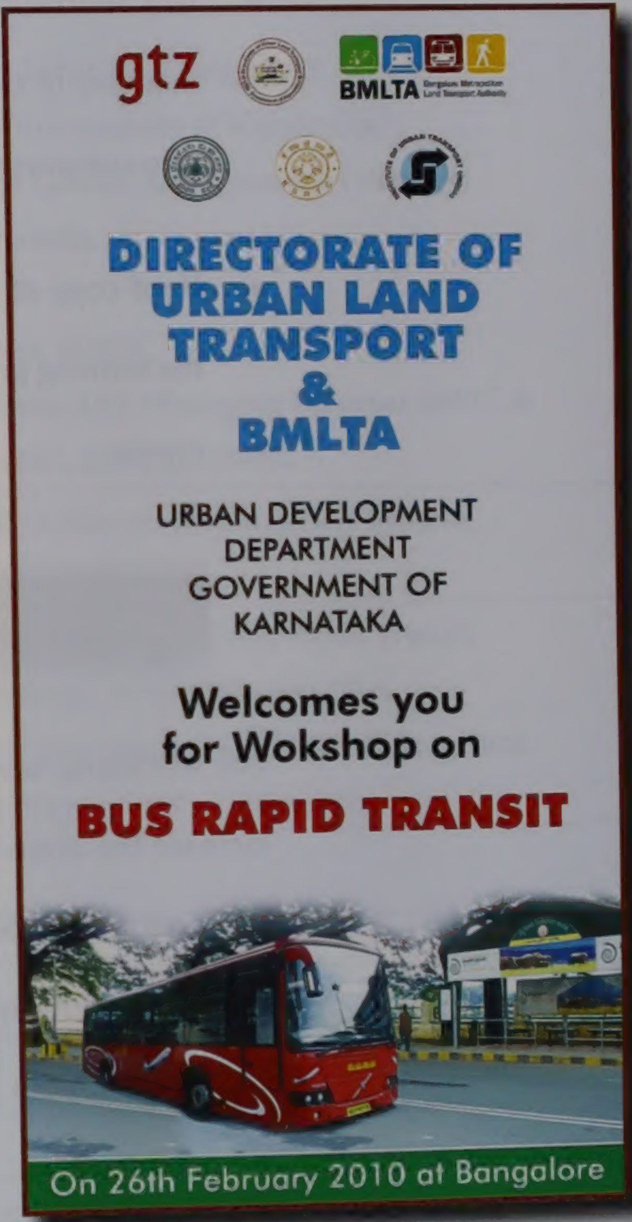
Bangalore Development Authority (BDA) supported this event with their inputs regarding the implementation of BRT System in Bangalore.

3. Participants for the Course

The participants for the course hailed from various government departments from in and outside Bangalore. There were more than 100 participants in the one day workshop. A full list of participants is included in annexure B.

The invitees to the workshop included the following:

- Foreign experts.
- Professionals from universities and research institutions.
- Administrators from departments dealing with transport planning and operations, infrastructure building agencies, policy planning, law enforcement and implementation agencies.
- Urban planners and Transport Planners from various stake holders.
- Non Government Organizations (NGOs)
- Press & Media



gtz BMLTA

DIRECTORATE OF URBAN LAND TRANSPORT & BMLTA

URBAN DEVELOPMENT DEPARTMENT GOVERNMENT OF KARNATAKA

Welcomes you for Wokshop on

BUS RAPID TRANSIT

On 26th February 2010 at Bangalore

4. Material Developed and Provided to the Participants

The participants received the following material as part of the course:

- Transportation Demand Management: A hard copy of the document developed by GTZ was distributed to all the participants.
- GTZ sourcebook CD: All participants were given this CD containing all the 27 modules of the GTZ Sourcebook on Sustainable Transport in English. The CD also contains various training course materials developed by GTZ.
- Hard copy of the Presentations from courses: All presentations given during the training program were provided to all the participants both in hard and soft copies.

Program, Exercises and Topics

The workshop was scheduled for one day. The main aim of this course was to increase the awareness among city officials on Bus Rapid Transport, through best practices in the developed countries and also sharing the problems during the implementation and execution of BRT projects.

Workshop Programe
WORKSHOP on BUS RAPID TRANSIT

Time	Topic
0900	Registration
0930	Welcome speech by Shri Mohammed Mohsin,IAS Director, DULT Inauguration by Shri Subir Hari Singh, IAS, Principal Secretary, Government of Karnataka, Shri S. Shankaerlinge Gowda, IAS, Transport Sectary, Government of Karnataka, Shri. Gaurav Gupta, IAS Managing Director, KSRTC, Shri Syed Zameer Pasha, IAS. Managing Director BMTC & Mohammed Mohsin IAS, Director, DULT.
0945	Introduction to BRT –A film on Janmarg BRT System - By Prof. Shivanand Swamy
1000	Sustainable Transport: The role of Bus Rapid Transit Speaker: Dr. DarioHidalgo, WRI-EMBARQ, USA Chairman: Shri Subir Hari Singh, IAS Principal Secretary, Urban Development Dept, Govt. of Karnataka
1045	BRT Components Speaker: Dr. DarioHidalgo, WRI-EMARQ, USA Chairman: Shri N Sivasailam, IAS Managing Director, BMRCL
1130 – 1145	Coffee Break
1145	Experience of Ahmadabad doing a BRT Speaker: Prof. Shivanand Swamy, CEPT University Chairman: Shri Gaurav Gupta, IAS Managing Director, KSRTC

Time	Topic
1230	Contracting and Tendering Speaker: Mr.Madhav Pai WRI-EMBARQ Chairman: Shri V. Madhu, IAS Principal Secretary, IDD
1315 - 1400	Lunch
1400	BRT Management and Public Private Parnership Speaker: Ms. Shreya Gadepalli ITDP Chairman:Shri Syed Zameer Pasha, IAS Managing Director, BMTC
1445	Modal Integration Speaker: Mr. Santhosh kodukula, GTZ-SUTP Chairman: Shri.S.Shankarlinge Gowda, IAS Secretary,Transport, Govt. of Karnataka
1530	Including BRT in a Comprehensive Mobility Plan Speaker: Ms. Sonia Kapoor, UMTC Chairman: Shri Praveen Sood, IAS Additional Commissioner of Police, Traffic and Road Safety & Shri N. Sheshadri, Seniour Transport Planner, Wilbur Smith Associates
1615 - 1630	Coffee Break
1630	Marketing a BRT system Speaker: Dr. Dario Hidalgo WRI-EMBARQ, USA Chairman: Prof. CEG Justo
1730	Valedictory address by Shri. A. Ravindra I.A.S Retired, Advisor to Hon. CM –Urban Affairs, Govt. of Karnataka

5. Welcome Speech by Director, DULT

Good morning,

It is indeed honor and my pleasure to welcome each and everyone to this BRT workshop organized by DULT and BMLTA and fully supported by GTZ-STUP, IUT, KSRTC, BMTC and BDA.

I am confident that today administration is ready to deal with some serious issues organized in the workshop with the help of all partners in Urban Development Department, Transport Department and CS of Government of Karnataka.

Ladies and Gentlemen,

Firstly I want to thank all of you whose hearts are geared towards giving serious inputs to people in this BRT workshop.

We need all the energy from you and ideas to plan, design, execute improve and deliver sound strategies to enhance BRT project in Bangalore and an initiative towards a better future for all in our cities.

If today cities are a battleground between cars and people, then we are firmly on the side of those who prefer walking to wheels.

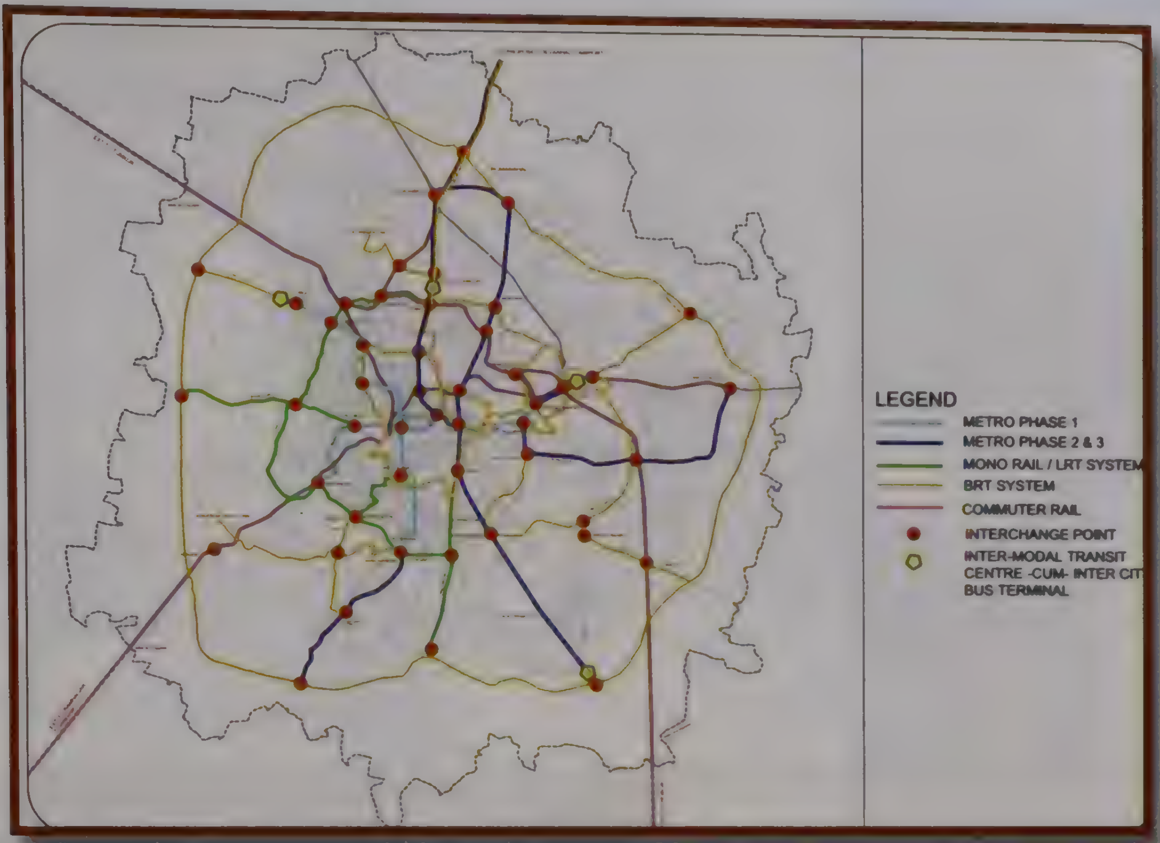
Further explain "Look at the poorest African nations- they will have some highway. But it is the quality of the footpath that determines the quality of life in a city," pointing out that in European cities, large areas are roped off for pedestrians and vibrant street life. While many roads have more space for walkers and cyclists than for car traffic.

Bogota as an example where in the local administration, under the extreme leadership of Mr. Penalosa widened footpaths which reduced the number of cars on the roads in peak hours created a world class bus rapid transit system reclaimed waterfronts for the public and – in a move that nearly got him impeached- banned cars from parking on pavements. As we say "Parking is not a constitutional right in any country". "It's a private problem and that should be solved in private spaces with private money."

In our cities only five percent of people buy cars but they do not know the roads in cities.

So as the say of Bogota Mr. Penalosa, "If we were in a war and there was a tremendous scarcity of fuel. I am sure you would give the fuel to the buses, not the cars, so the city can function. Now we have an extremes scarcity of space. It would be most democratic and efficient to allocate this space in favour of the most people- for buses, cycles and pedestrians."

Apart from considerations of equality it is sheer mathematical impossibility of a city where everyone drives a car regularly. "Bigger roads and flyovers will never solve the problem of traffic. It has never solved the problem in any city in the world".



BRT Corridor for Bangalore, Source:CTTP Bangalore

At least we now should include a bus lane and wide cycling paths and pavements. "A bus lane will move about 40,000 people per hour. One lane of cars will transport less than 2,000 people. Which is more efficient?

It is the mission of our Department to make this cities efficient access with rapid transport system for the all the road users.

Today I feel that the commitment to this BRT workshop instills in me the confidence that this initiative for BRT will indeed be turned into a moment of magic in our cities now to sheer of problems and that is basically mobility and sustainability.

Lastly I thank Principal Secretary of Urban Development Department, Sri Subir Hari Singh, Sri Shankarlinge Gowda Transport, Sri Gaurav Gupta MD KSRTC, Sri Zayeed Zameer Pasha, Sri Dario Hidalgo from Embarq Washington, Prof. Shivananda Swamy from Ahmedabad and others.

Thank you
Mohammed Mohsin I.A.S,
Director,DULT

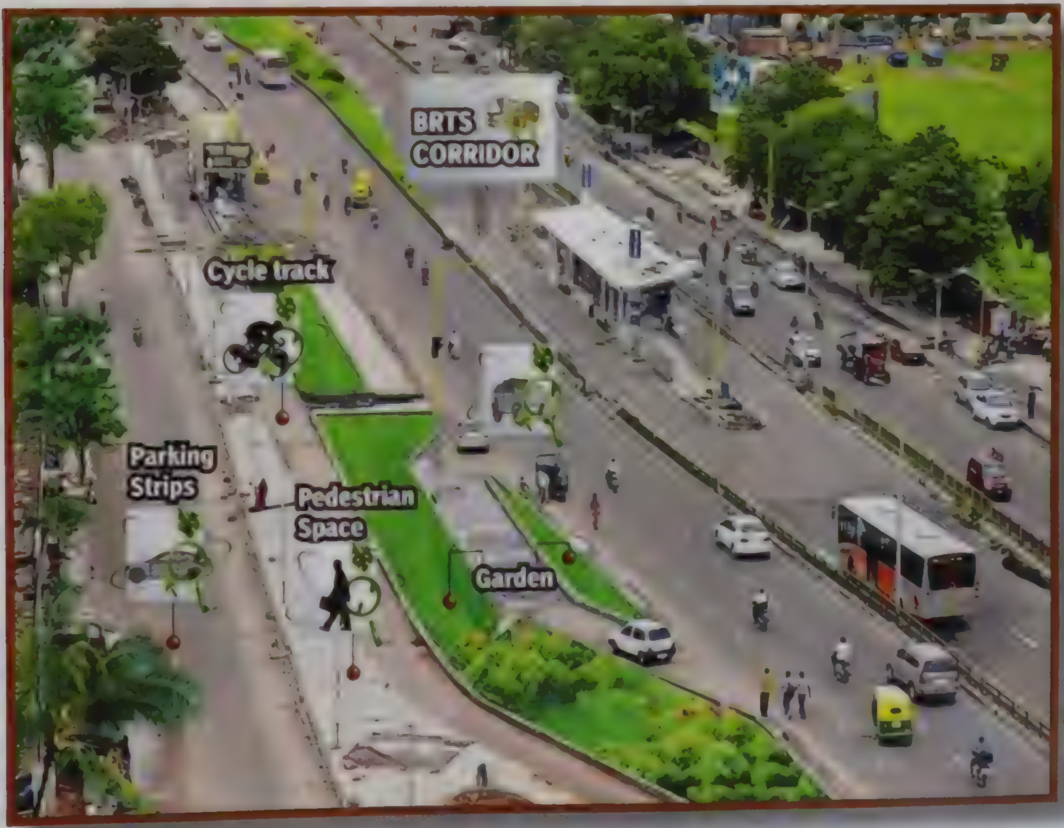
6. Summary of Presentations

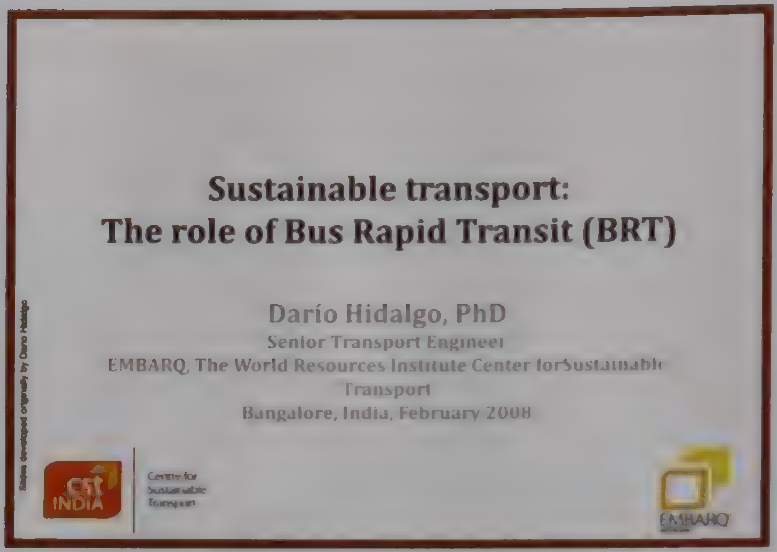
The workshop was organized by DULT in association with the concerned organizations for creating awareness among the transport professionals and academicians to promote the implementation of BRT system for any potential Indian city (in particular Bangalore) for improving the overall mobility. The sessions were segregated in an articulated manner to describe the various stages in the process of planning an efficient, reliable, cost-effective Bus Rapid Transit System (BRTS). This chapter summarizes the content of the session along with few presentations.

Session1: The role of Bus Rapid Transit

Dr. Dario Hidalgo explained the necessity for mass transit systems especially like BRT for the mobility needs of Indian cities. Any successful urban transport system should generate low travel times and travel costs for people and goods, Permits equal access to urban life opportunities (social services, education, health, and recreation), Provide adequate support to desired form, size and density of the city-region, Contributes to the improvement of air quality and urban environment. By highlighting the concerns like two fold

increase in Indian urban population from 285 Million (2001) to 820 Million (2051); faster growth of vehicles; inadequate budget for catering the private transport demand; he exemplified the need for BRT and suggested few solutions like Non-motorized transport (NMT), Transit Oriented Development (TOD), Disincentives to indiscriminate private vehicle use and Bus Rapid Transit (BRT).



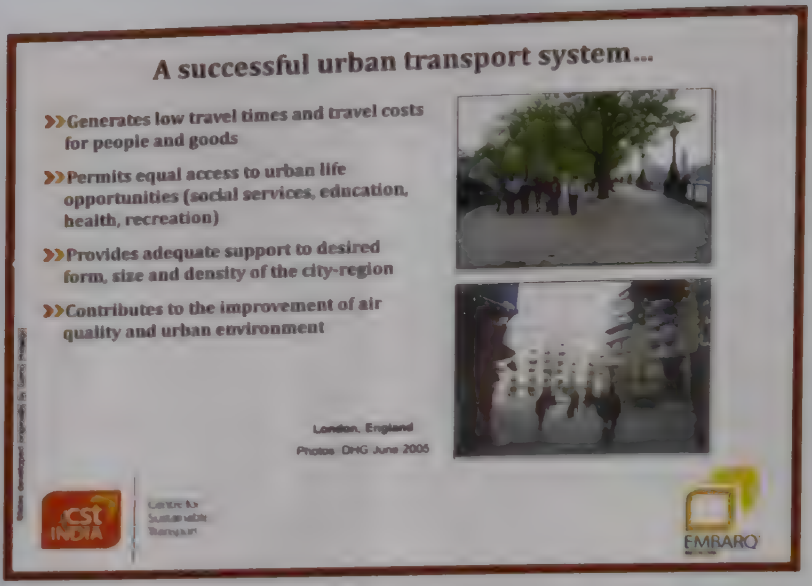


Sustainable transport:
The role of Bus Rapid Transit (BRT)

Darío Hidalgo, PhD
Senior Transport Engineer
EMBARQ, The World Resources Institute Center forSustainable Transport
Bangalore, India, February 2008

Slides developed originally by Dario Hidalgo

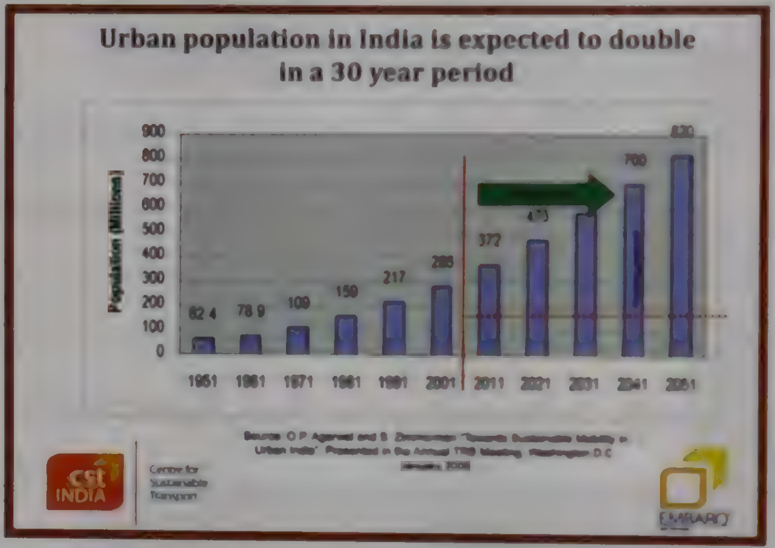
Centre for Sustainable Transport



A successful urban transport system...

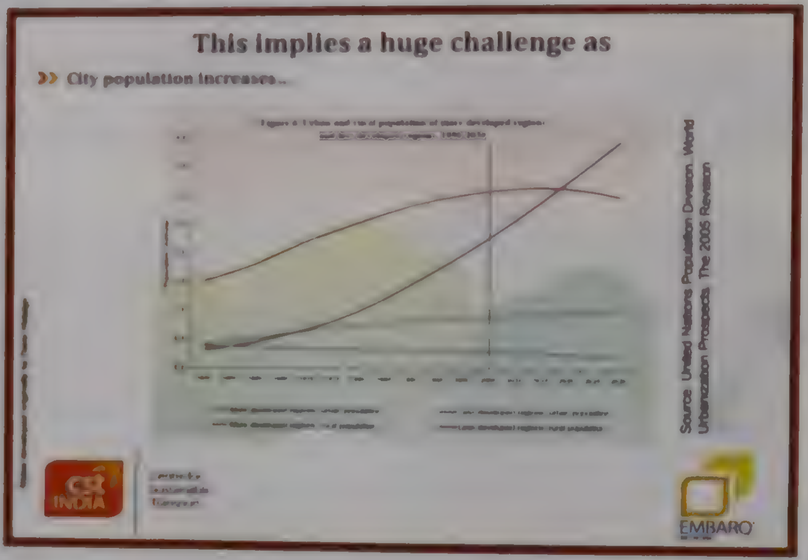
- Generates low travel times and travel costs for people and goods
- Permits equal access to urban life opportunities (social services, education, health, recreation)
- Provides adequate support to desired form, size and density of the city-region
- Contributes to the improvement of air quality and urban environment

London, England
Photos: DHG June 2005



Urban population in India is expected to double in a 30 year period

Source: O.P. Agarwal and S. Zimmerman "Towards Sustainable Mobility in Urban India". Presented in the Annual TRB Meeting, Washington D.C. January 2008



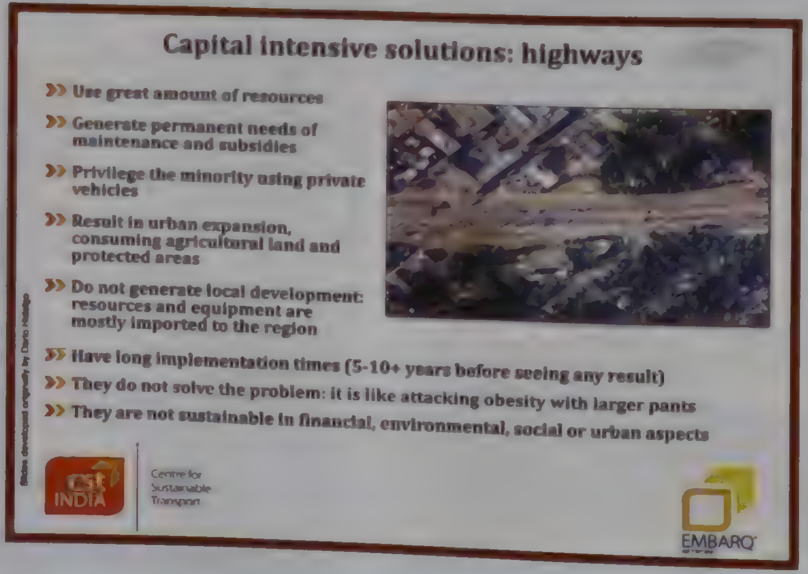
This implies a huge challenge as

- City population increases...

Source: United Nations Population Division, World Urbanization Prospects: The 2005 Revision

Capital & Land intensive solutions: highways

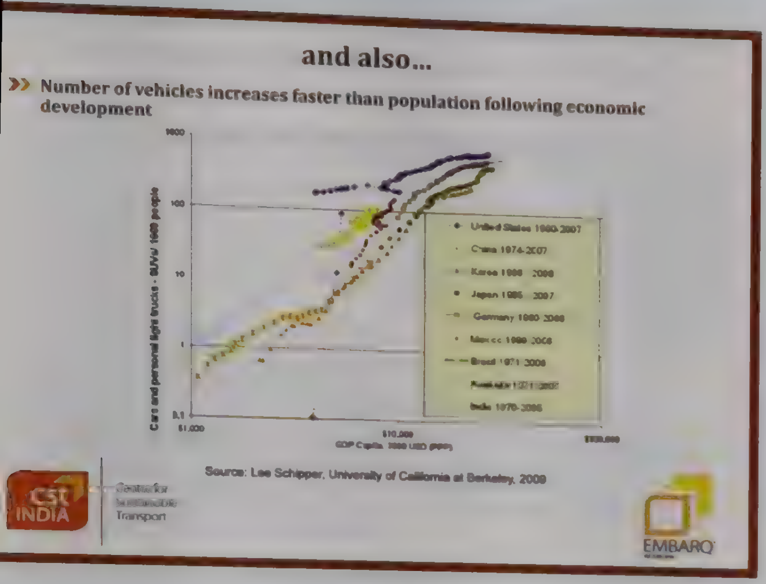
Courtesy Transfuture.net



Capital intensive solutions: highways

- Use great amount of resources
- Generate permanent needs of maintenance and subsidies
- Privilege the minority using private vehicles
- Result in urban expansion, consuming agricultural land and protected areas
- Do not generate local development: resources and equipment are mostly imported to the region
- Have long implementation times (5-10+ years before seeing any result)
- They do not solve the problem: it is like attacking obesity with larger pants
- They are not sustainable in financial, environmental, social or urban aspects

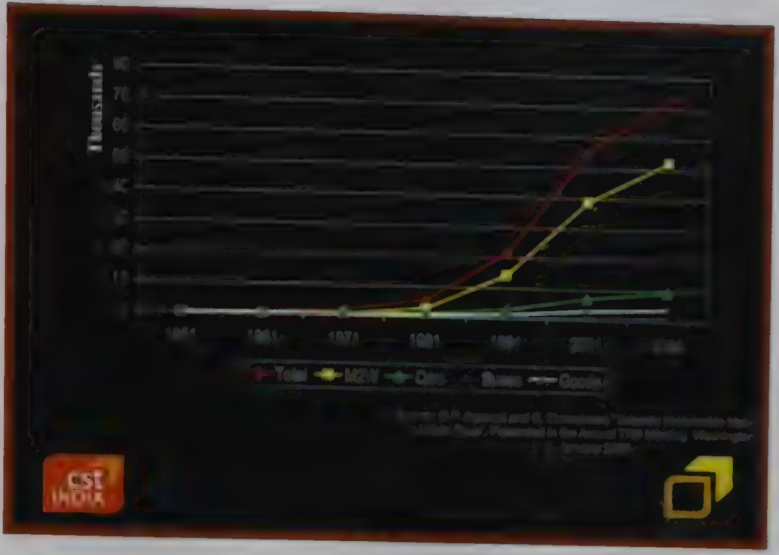
Slides developed originally by Dario Hidalgo

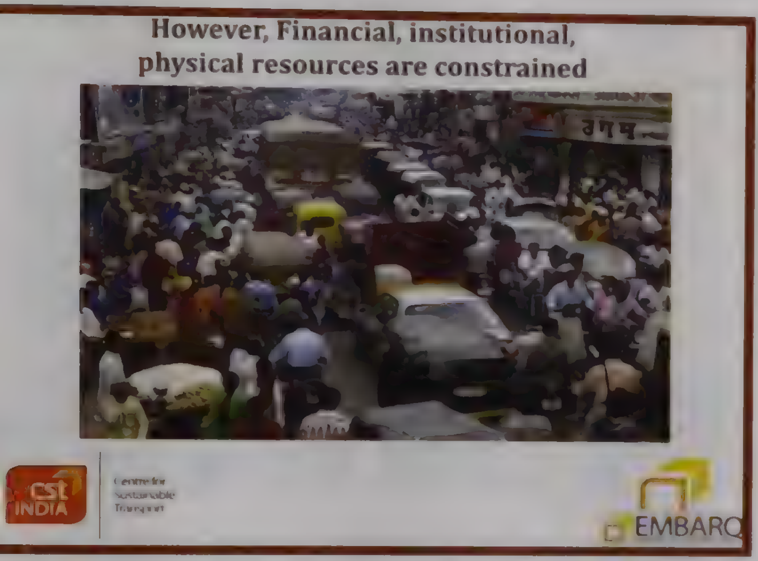


and also...

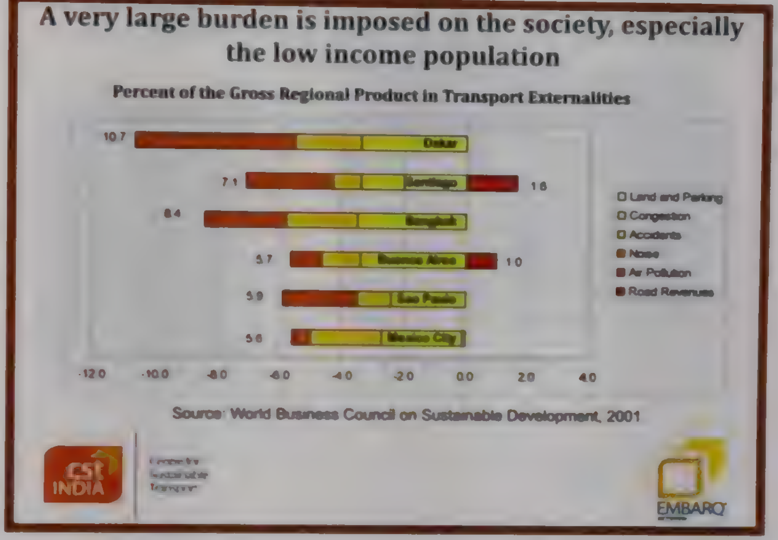
- Number of vehicles increases faster than population following economic development

Source: Lee Schipper, University of California at Berkeley, 2009





However, Financial, institutional, physical resources are constrained



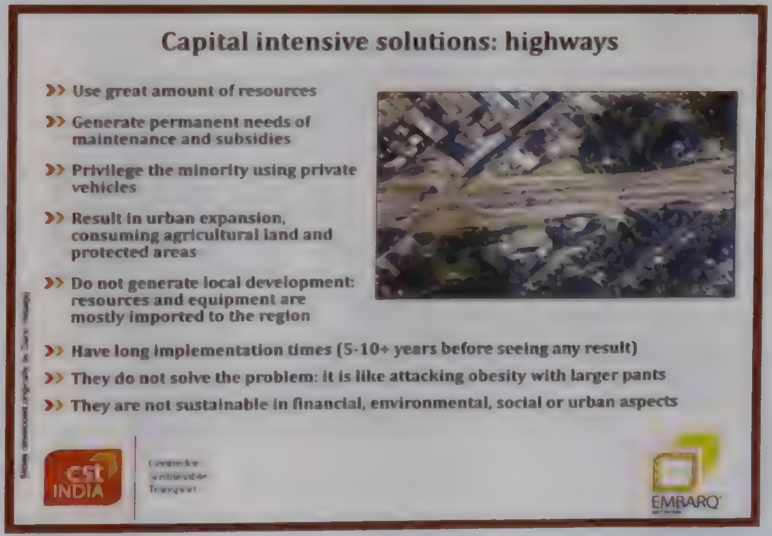
A very large burden is imposed on the society, especially the low income population

Percent of the Gross Regional Product in Transport Externalities

Source: World Business Council on Sustainable Development, 2001

Capital & Land intensive solutions: highways

Courtesy Transfuture.net



Capital intensive solutions: highways

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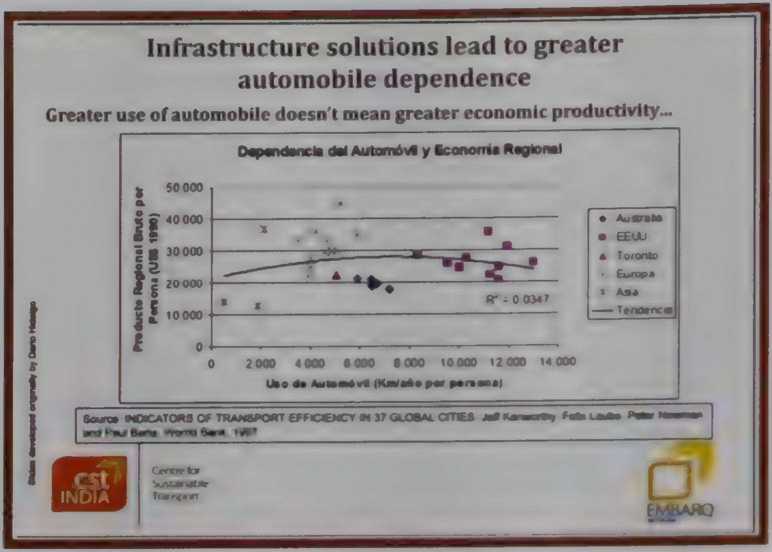

Infrastructure solutions lead to greater automobile dependence

Greater use of automobile doesn't mean greater economic productivity...

Source: INDICATORS OF TRANSPORT EFFICIENCY IN 37 GLOBAL CITIES. Jeff Kenworthy, Felix Laube, Peter Newman and Paul Barter. World Bank, 1997

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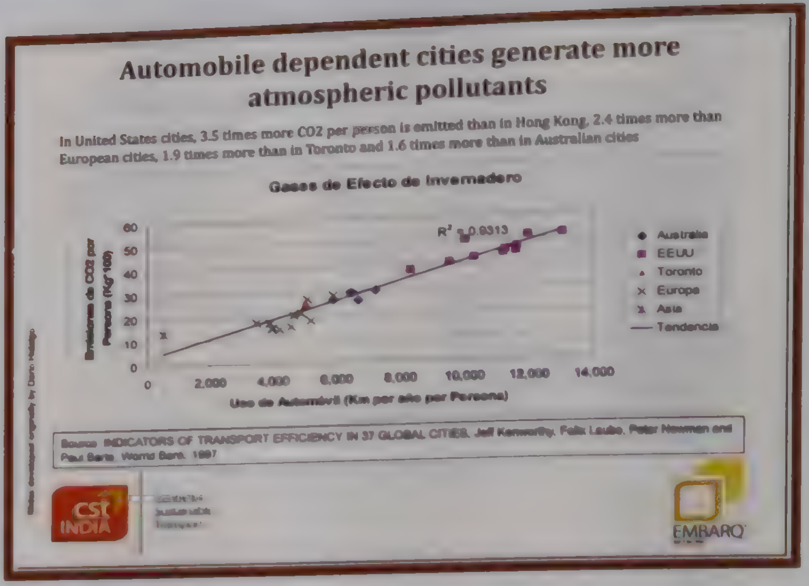

Automobile dependent cities generate more atmospheric pollutants

In United States cities, 3.5 times more CO2 per person is emitted than in Hong Kong, 2.4 times more than European cities, 1.9 times more than in Toronto and 1.6 times more than in Australian cities

Source: INDICATORS OF TRANSPORT EFFICIENCY IN 37 GLOBAL CITIES. Jeff Kenworthy, Felix Laube, Peter Newman and Paul Barter. World Bank, 1997

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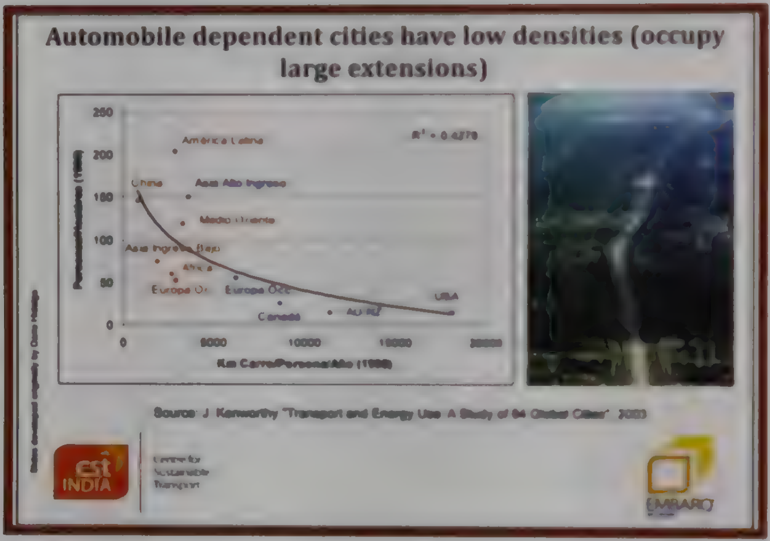

Automobile dependent cities have low densities (occupy large extensions)

Source: J. Kenworthy "Transport and Energy Use: A Study of 84 Global Cities", 2003

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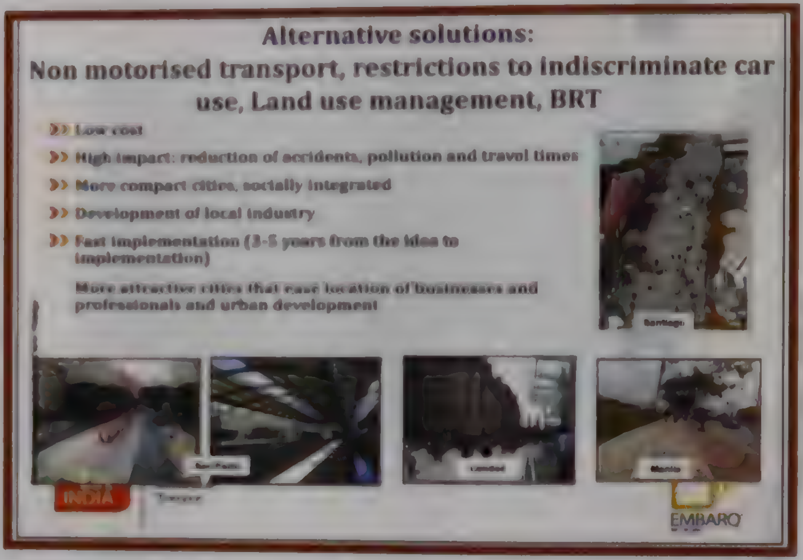
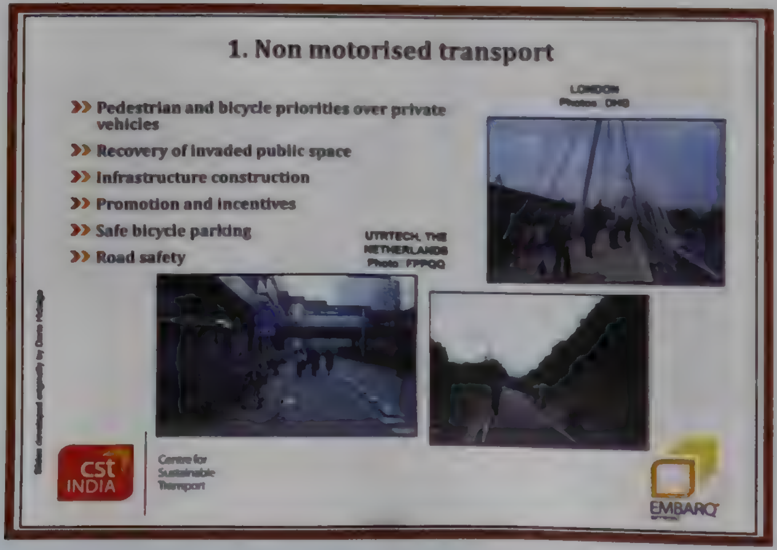


Alternative solutions: Non motorised transport, restrictions to indiscriminate car use, Land use management, BRT

- Low cost
- High impact: reduction of accidents, pollution and travel times
- More compact cities, socially integrated
- Development of local industry
- Fast implementation (3-5 years from the idea to implementation)

More attractive cities that ease location of businesses and professionals and urban development

Santiago
Manila



1. Non motorised transport

- Pedestrian and bicycle priorities over private vehicles
- Recovery of invaded public space
- Infrastructure construction
- Promotion and incentives
- Safe bicycle parking
- Road safety

LONDON
Photos: DHS

UTRTECH, THE NETHERLANDS
Photo: FPPQQ

Slides developed originally by Dario Hidalgo

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1. Non motorised transport

ALAMEDA EL PORVENIR, BOGOTA
Photos: FPPQQ

CARRERA 15, BOGOTA

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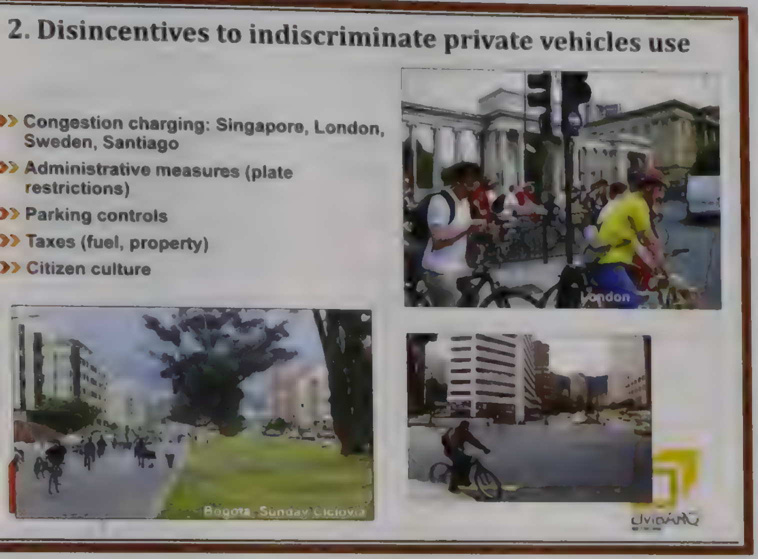
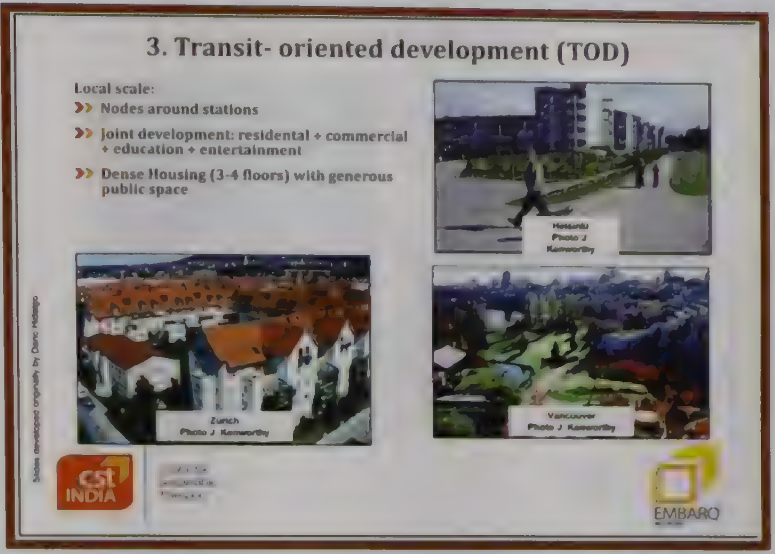


2. Disincentives to indiscriminate private vehicles use

- Congestion charging: Singapore, London, Sweden, Santiago
- Administrative measures (plate restrictions)
- Parking controls
- Taxes (fuel, property)
- Citizen culture

London
Bogota, Sunday Ciclovia
EMBARQ



3. Transit- oriented development (TOD)

Local scale:

- Nodes around stations
- Joint development: residental + commercial + education + entertainment
- Dense Housing (3-4 floors) with generous public space

Helsinki
Photo J Kenworthy
Zurich
Photo J Kenworthy
Vancouver
Photo J Kenworthy
Slides developed originally by Dario Hidalgo
cst INDIA
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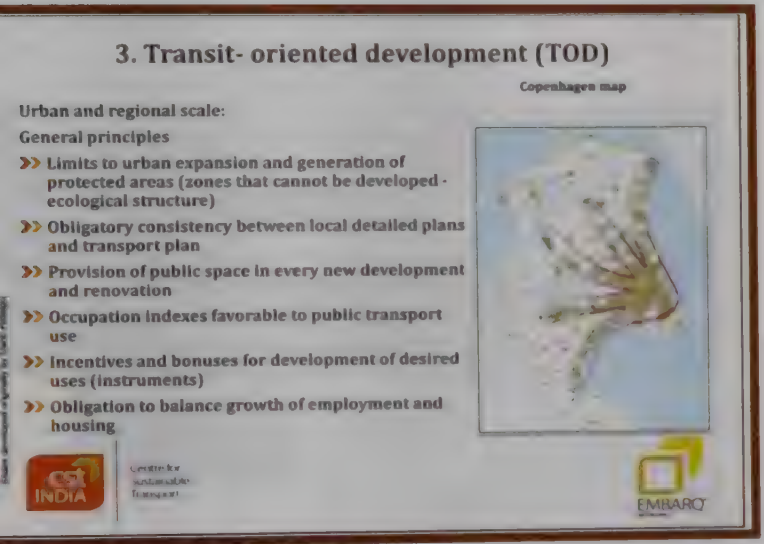

3. Transit- oriented development (TOD)

Urban and regional scale:

General principles

- Limits to urban expansion and generation of protected areas (zones that cannot be developed - ecological structure)
- Obligatory consistency between local detailed plans and transport plan
- Provision of public space in every new development and renovation
- Occupation indexes favorable to public transport use
- Incentives and bonuses for development of desired uses (instruments)
- Obligation to balance growth of employment and housing

Copenhagen map
cst INDIA
Centre for Sustainable Transport
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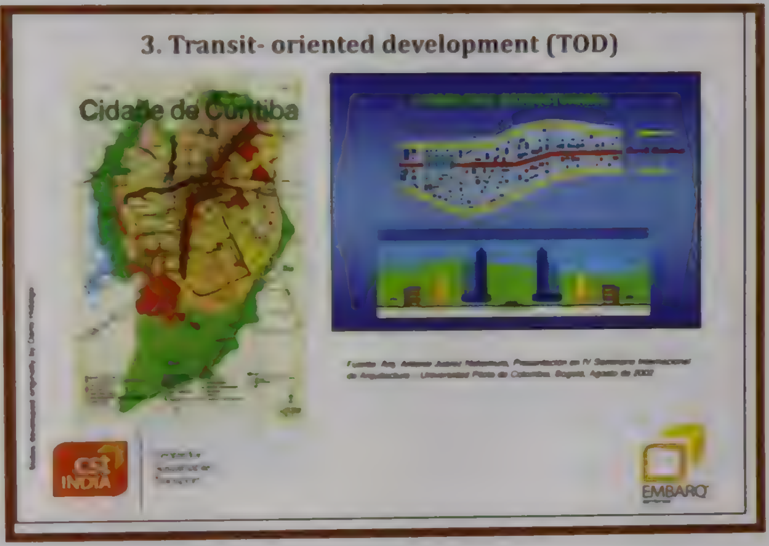

3. Transit- oriented development (TOD)

Fuente: Arq. Antonio Juárez Nakashima, Presentación en IV Seminario Internacional de Arquitectura – Universidad Piloto de Colombia, Bogotá, Agosto de 2002

Cidade de Curitiba
Slides developed originally by Dario Hidalgo
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3. Transit- oriented development (TOD)

Curitiba, Brazil

Source: http://www.curitiba-parana.com/arquitetura-urbanismo.htm

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4. Bus Rapid Transit (BRT)

Seattle
Adelaida
Quito
Bogota
Los Angeles
Rouen
Miami
Brisbane
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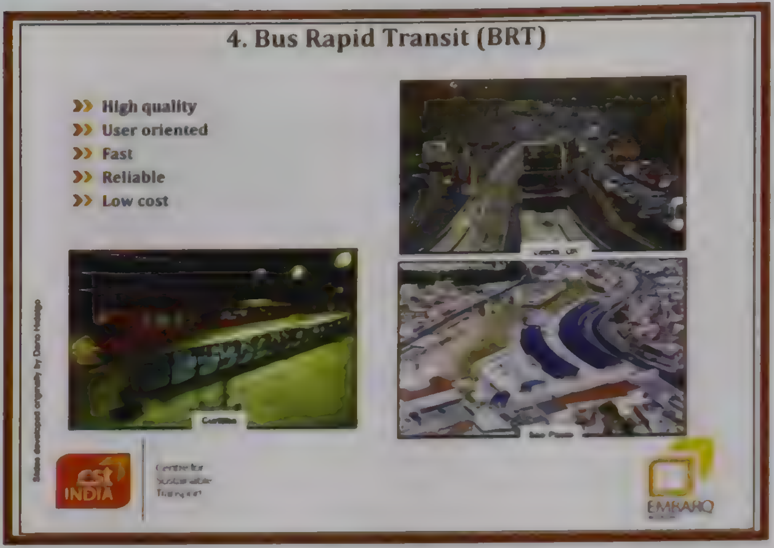

4. Bus Rapid Transit (BRT)

- High quality
- User oriented
- Fast
- Reliable
- Low cost

Leeds, UK
Curitiba
Sao Paulo
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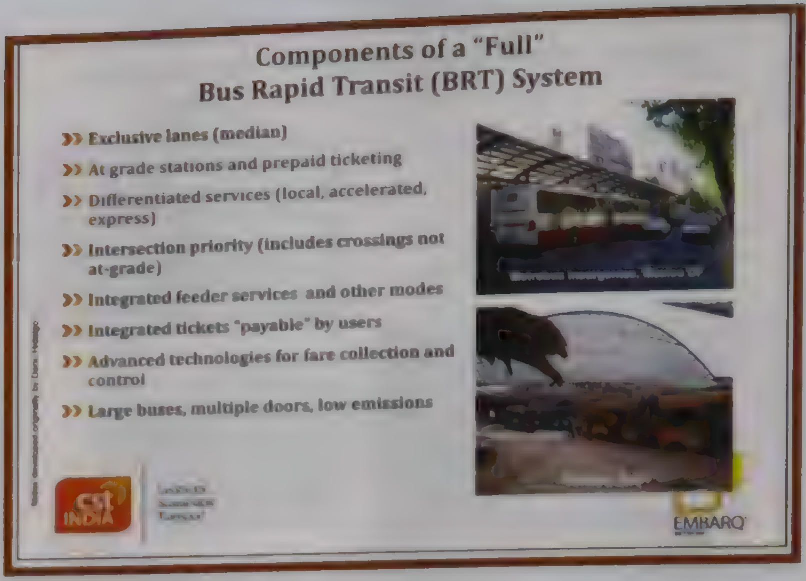
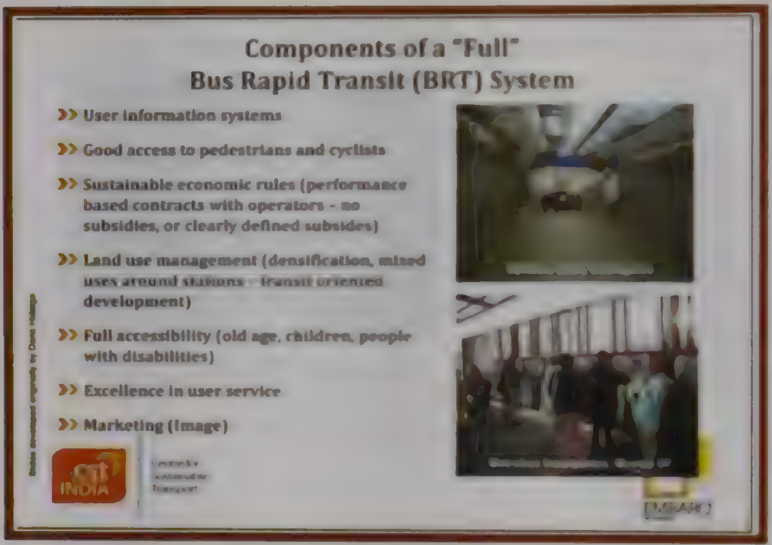


Components of a "Full" Bus Rapid Transit (BRT) System

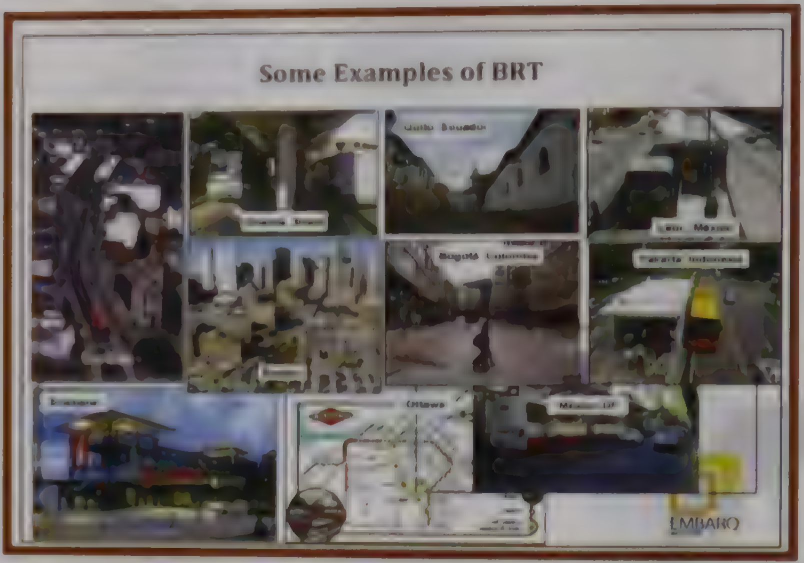
- Exclusive lanes (median)
- At grade stations and prepaid ticketing
- Differentiated services (local, accelerated, express)
- Intersection priority (includes crossings not at-grade)
- Integrated feeder services and other modes
- Integrated tickets "payable" by users
- Advanced technologies for fare collection and control
- Large buses, multiple doors, low emissions

Slides developed originally by Dario Hidalgo

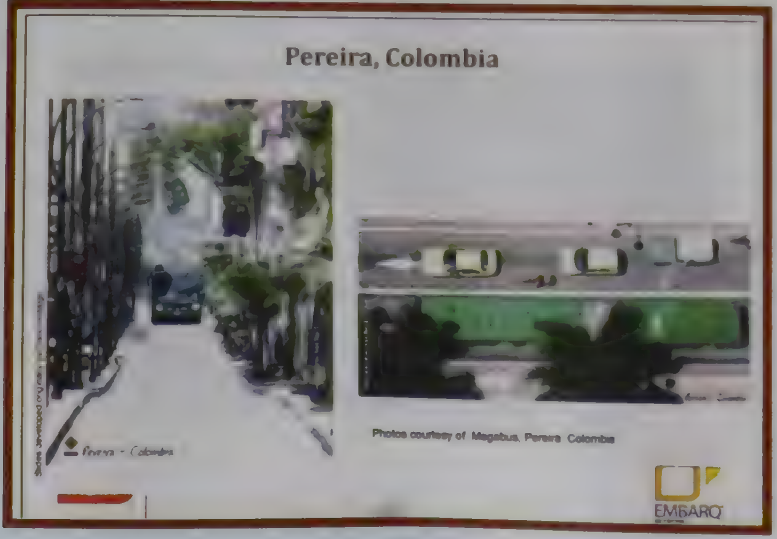


Components of a "Full" Bus Rapid Transit (BRT) System

- User information systems
- Good access to pedestrians and cyclists
- Sustainable economic rules (performance based contracts with operators – no subsidies, or clearly defined subsidies)
- Land use management (densification, mixed uses around stations – transit oriented development)
- Full accessibility (old age, children, people with disabilities)
- Excellence in user service
- Marketing (image)

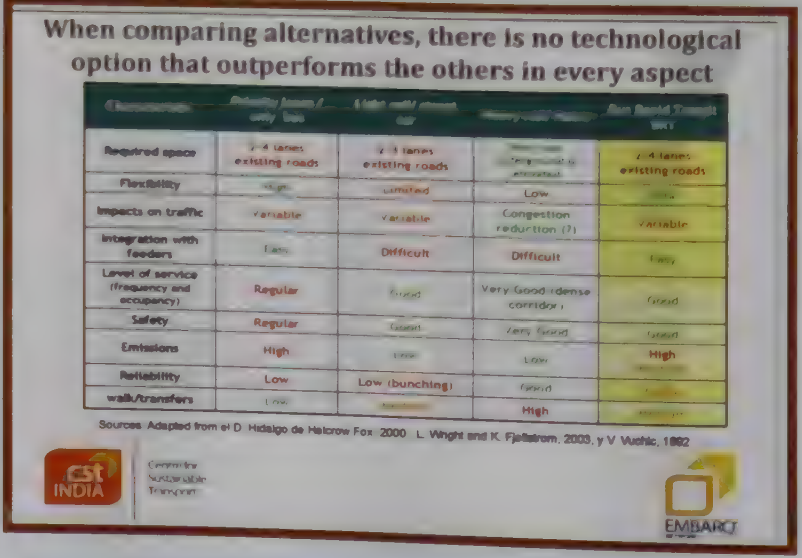


Some Examples of BRT



Pereira, Colombia

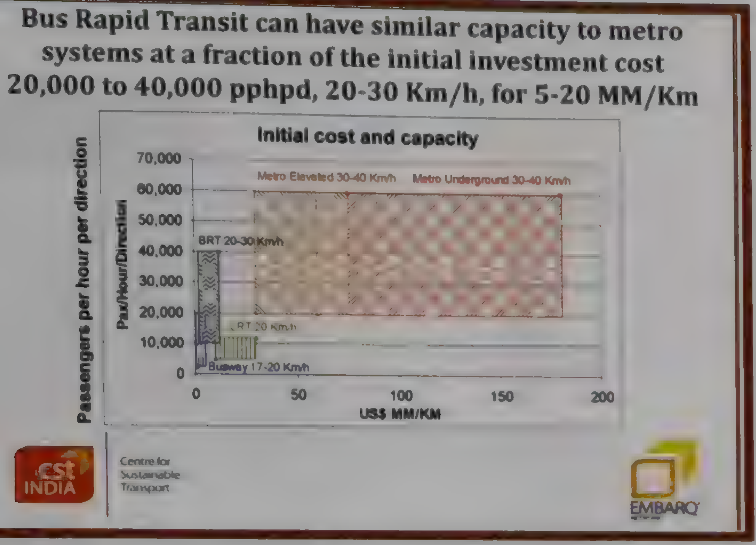
Photos courtesy of Megabus, Pereira, Colombia



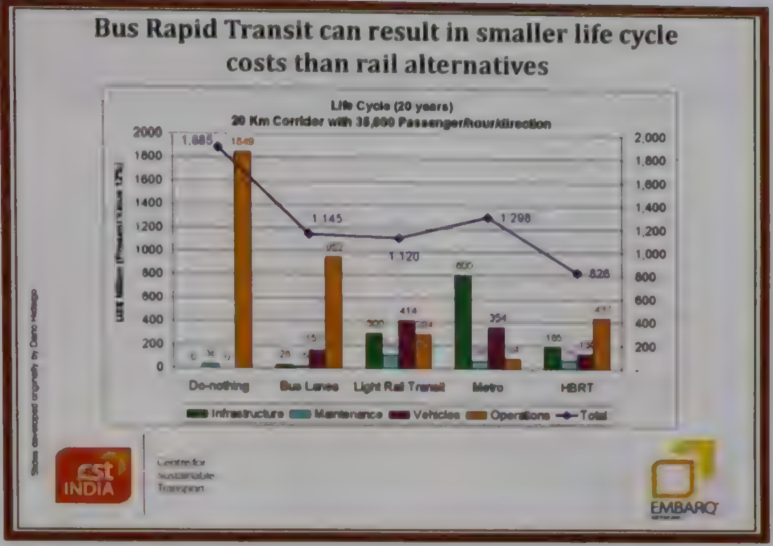
When comparing alternatives, there is no technological option that outperforms the others in every aspect

Characteristic	Priority lanes / only bus	Light rail/ street car	Heavy rail/ Metro	Bus Rapid Transit (BRT)
Required space	2-4 lanes existing roads	2-3 lanes existing roads	[illegible]	2-4 lanes existing roads
Flexibility	High	Limited	Low	High
Impacts on traffic	Variable	Variable	Congestion reduction (?)	Variable
Integration with feeders	Easy	Difficult	Difficult	Easy
Level of service (frequency and occupancy)	Regular	Good	Very Good (dense corridor)	Good
Safety	Regular	Good	Very Good	Good
Emissions	High	Low	Low	High [illegible]
Reliability	Low	Low (bunching)	Good	[illegible]
walk/transfers	Low	[illegible]	High	[illegible]

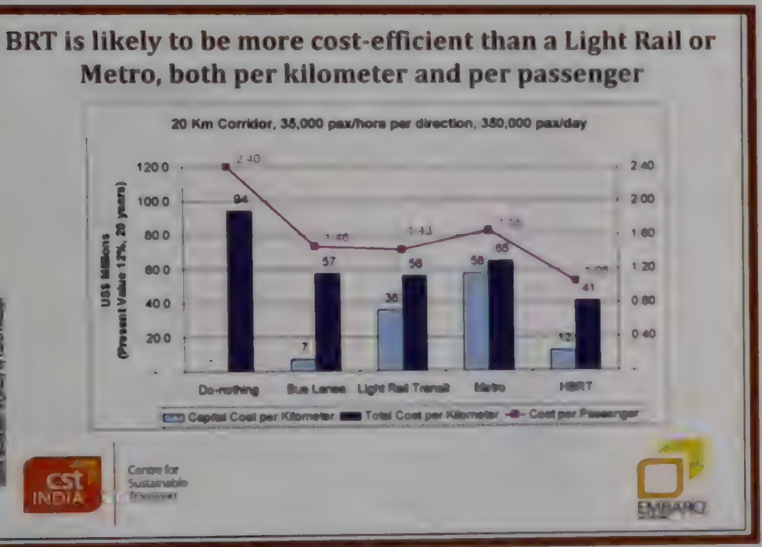
Sources: Adapted from el D. Hidalgo de Halcrow Fox, 2000, L. Wright and K. Fjellstrom, 2003, y V. Vuchic, 1992



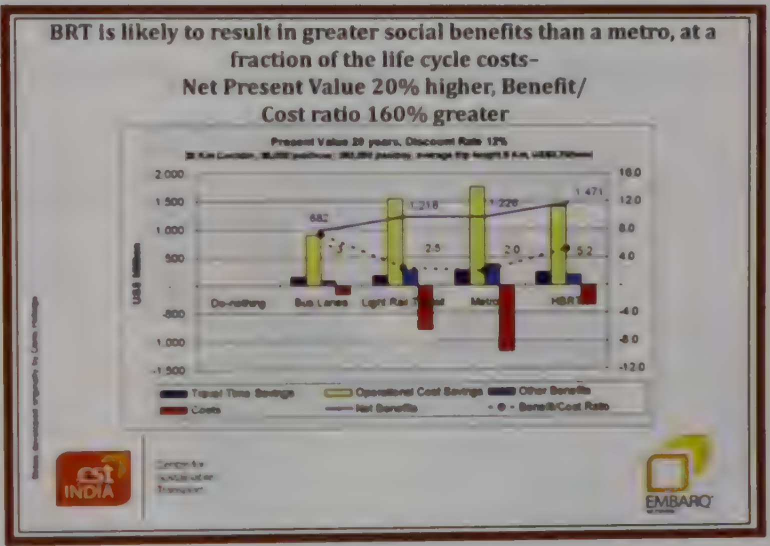
Bus Rapid Transit can have similar capacity to metro systems at a fraction of the initial investment cost 20,000 to 40,000 pphpd, 20-30 Km/h, for 5-20 MM/Km



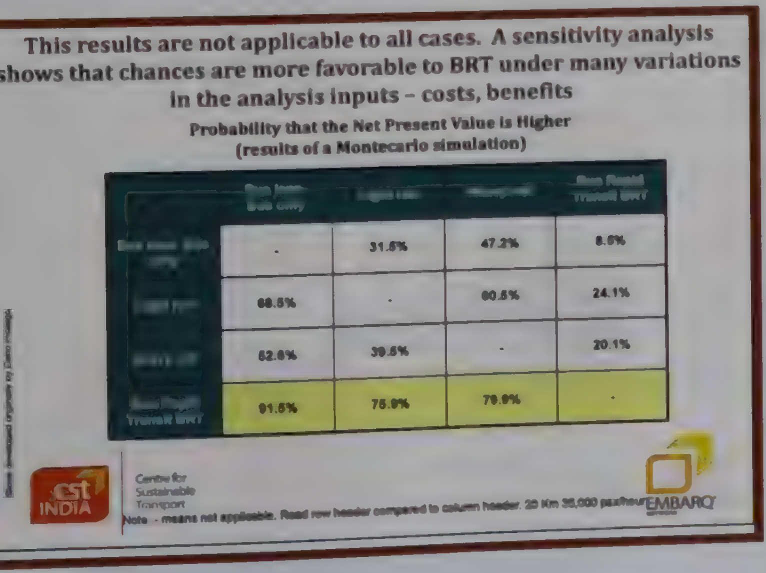
Bus Rapid Transit can result in smaller life cycle costs than rail alternatives



BRT is likely to be more cost-efficient than a Light Rail or Metro, both per kilometer and per passenger



BRT is likely to result in greater social benefits than a metro, at a fraction of the life cycle costs- Net Present Value 20% higher, Benefit/ Cost ratio 160% greater



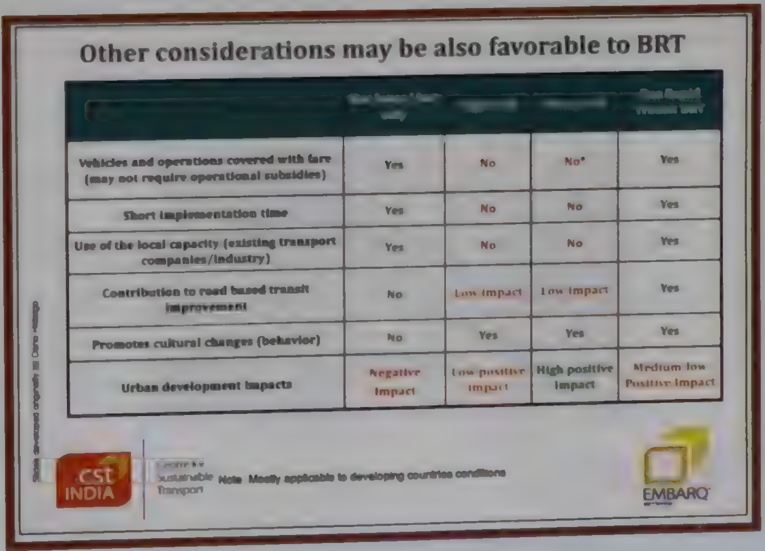
This results are not applicable to all cases. A sensitivity analysis shows that chances are more favorable to BRT under many variations in the analysis inputs – costs, benefits

Probability that the Net Present Value is Higher (results of a Montecarlo simulation)

	Bus lanes Bus only	[illegible]	[illegible]	Bus Rapid Transit BRT
[illegible]	-	31.5%	47.2%	8.6%
[illegible]	68.5%	-	60.5%	24.1%
[illegible]	52.6%	39.5%	-	20.1%
Bus Rapid Transit BRT	91.5%	75.9%	79.9%	-

Note - means not applicable. Read row header compared to column header. 20 Km 35,000 pax/hour

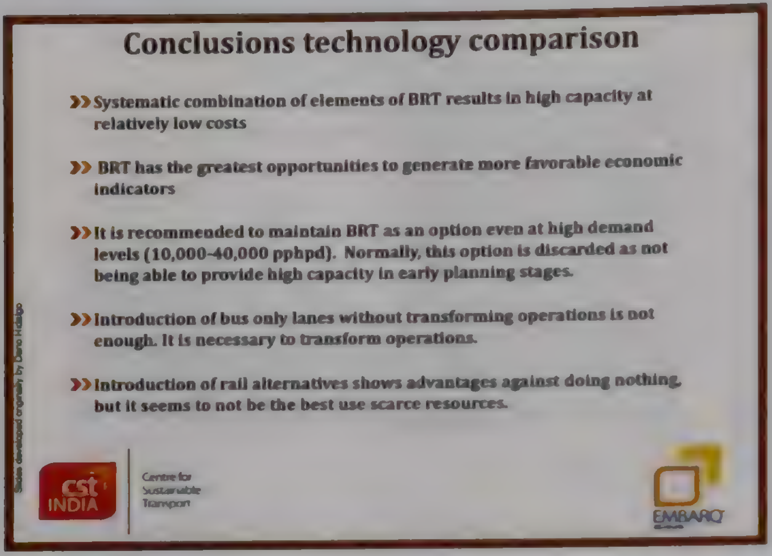
cst INDIA
Centre for Sustainable Transport
EMBARQ



Other considerations may be also favorable to BRT

	[illegible]	[illegible]	[illegible]	Bus Rapid Transit BRT
Vehicles and operations covered with fare (may not require operational subsidies)	Yes	No	No*	Yes
Short implementation time	Yes	No	No	Yes
Use of the local capacity (existing transport companies/industry)	Yes	No	No	Yes
Contribution to road based transit improvement	No	Low impact	Low impact	Yes
Promotes cultural changes (behavior)	No	Yes	Yes	Yes
Urban development impacts	Negative Impact	Low positive impact	High positive impact	Medium low Positive impact

Note Mostly applicable to developing countries conditions



Conclusions technology comparison

- Systematic combination of elements of BRT results in high capacity at relatively low costs
- BRT has the greatest opportunities to generate more favorable economic indicators
- It is recommended to maintain BRT as an option even at high demand levels (10,000-40,000 pphpd). Normally, this option is discarded as not being able to provide high capacity in early planning stages.
- Introduction of bus only lanes without transforming operations is not enough. It is necessary to transform operations.
- Introduction of rail alternatives shows advantages against doing nothing, but it seems to not be the best use scarce resources.

Slides developed originally by Dario Hidalgo

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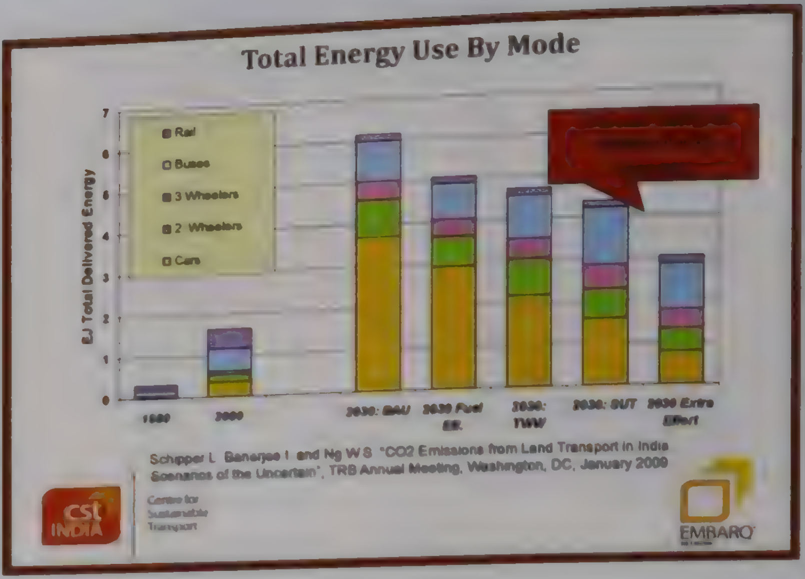

Total Energy Use By Mode

Schipper L. Banerjee I. and Ng W.S. "CO2 Emissions from Land Transport in India Scenarios of the Uncertain", TRB Annual Meeting, Washington, DC, January 2009

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In Bogotá we have great improvements...

Slides developed originally by Dario Hidalgo

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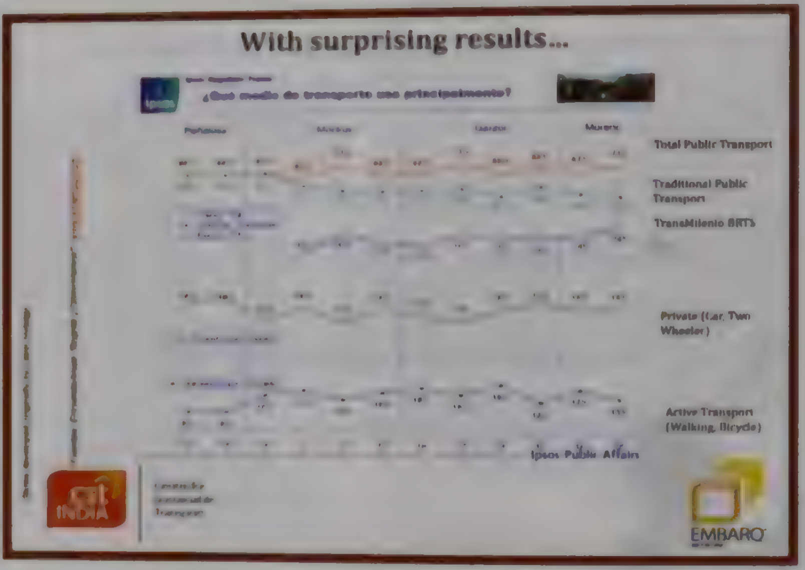
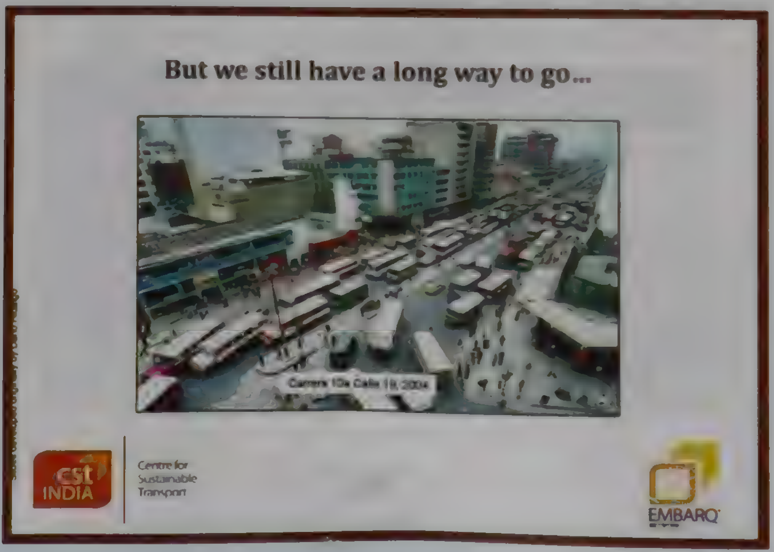


With surprising results...



But we still have a long way to go...

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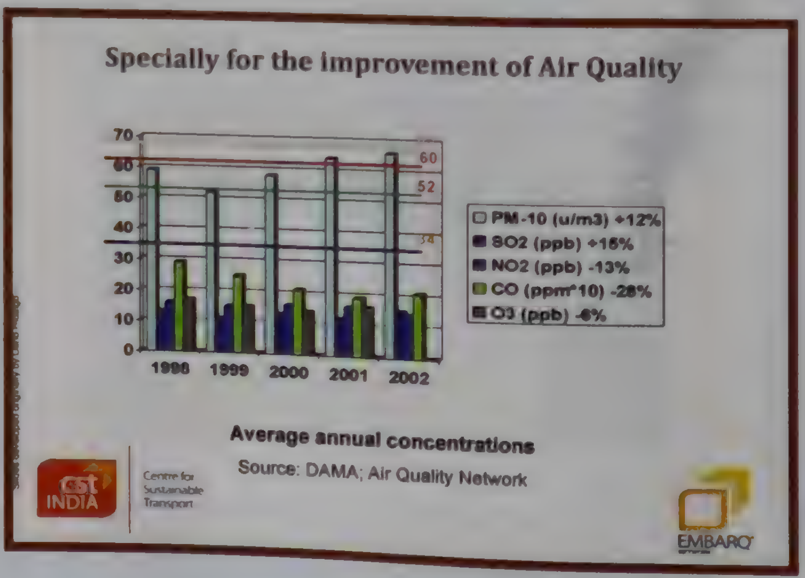

Specially for the improvement of Air Quality

Average annual concentrations

Source: DAMA; Air Quality Network

Slides developed originally by Dario Hidalgo

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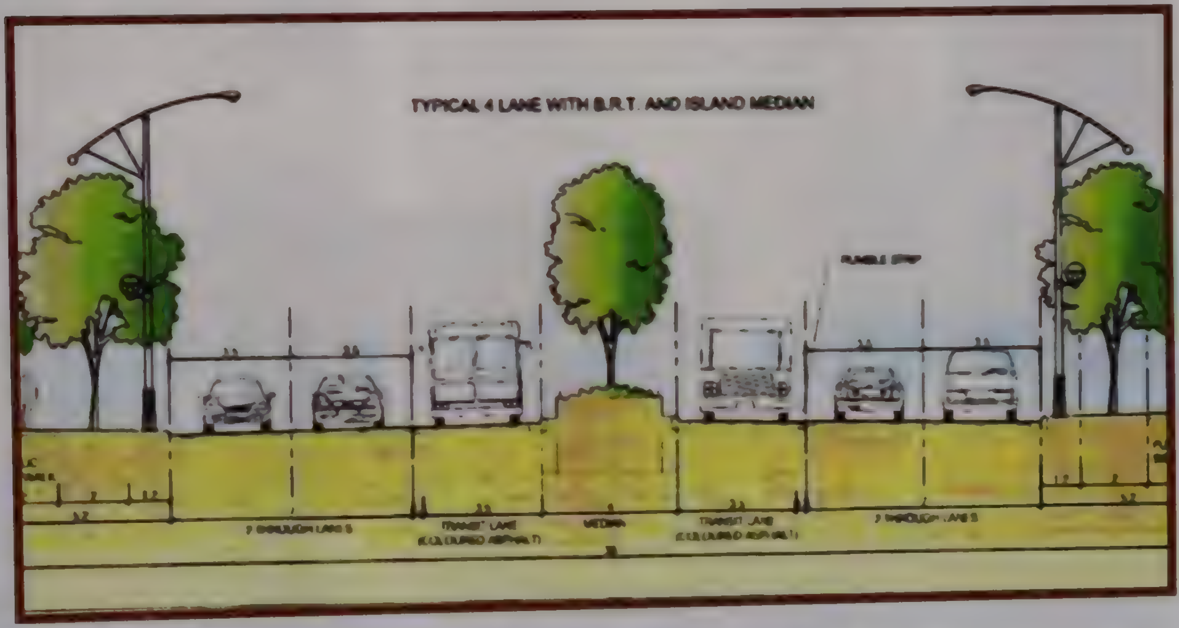
Question and Answer:

Q. Whether BRT can be implemented in Bangalore? What's your view on Bangalore Metro? How difficult is it to integrate BRT with the Metro? Will Metro oppose BRT? (Shri. M N Reddy)

Ans: Metro is good to have. But in one go it will not solve the problem. It should be well integrated with rest of the system. Metro will not lead to overall city if it's not well integrated with bus to Metro and Metro to the bus. It should be worked at the planning stage itself. A BRT can be laid in the limited resources. It requires only 10% of the Metro investment to do a good BRT. 200 Km of BRT can be implemented in the same amount of resources that's spent for 20 km of Metro construction.


TYPICAL 4 LANE WITH B.R.T. AND ISLAND MEDIAN
RUMBLE STRIP
2 THROUGH LANES
TRANSIT LANE (COLOURED ASPHALT)
MEDIAN
TRANSIT LANE (COLOURED ASPHALT)
2 THROUGH LANES

Q. If we look at Bangalore Bus System right now we have three terminals in the core area. All the buses are coming in & going out. With this present routing system if we have BRT there will be lot of buses stack in the core city area for a radius of 3 kms. Do we need to look into Routing system? (Mr. Vinay , Center for Science , Technology and Policy)

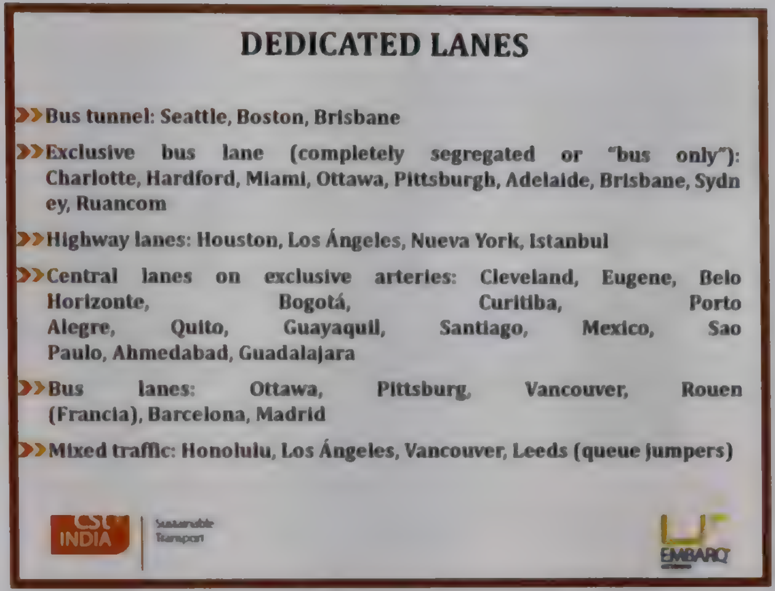
Ans: Speaker replied that we need to properly redesign the routing system.

Session 2: BRT Components

In this presentation the speaker with his rich experience by executing iconic BRT projects like Bogota, Istanbul etc., emphasized the things to be included and not to be for the attainment of a high-quality BRT system. The speaker explained a full BRTS with its primary and secondary components. Primary components includes; Exclusive lanes, at grade stations and prepaid ticketing, Differentiated services, Intersection priority, Integrated feeder services and other Modes, Integrated tickets, technologies for fare collection and control, large buses, multiple doors, low emissions. Along with secondary components which included User Information Systems, Good access to NMT, Sustainable economic rules Land use management (densification, mixed uses around stations – transit oriented development) , Excellence in user service Marketing.

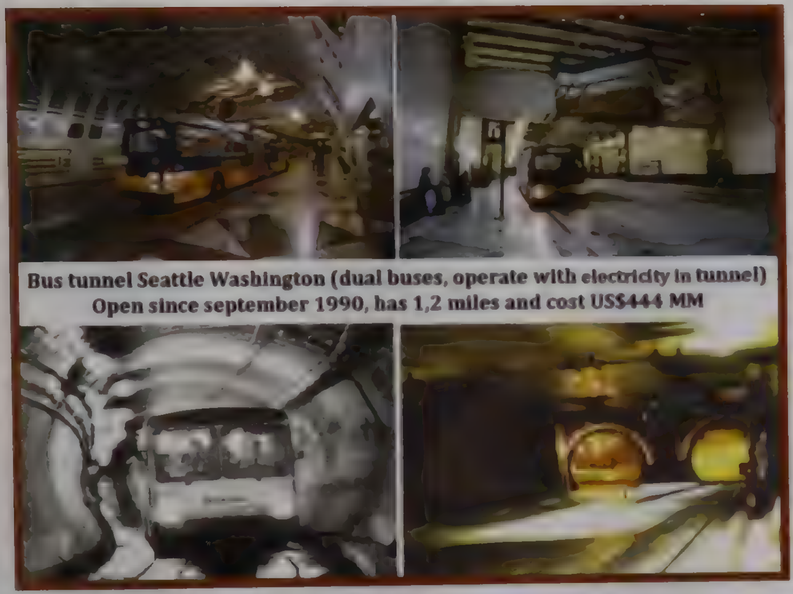
Bus Rapid Transit (BRT) Components

Darío Hidalgo, PhD
Senior Transport Engineer
EMBARQ, The World Resources Institute Center for Sustainable Transport
Bangalore, India, February 2008

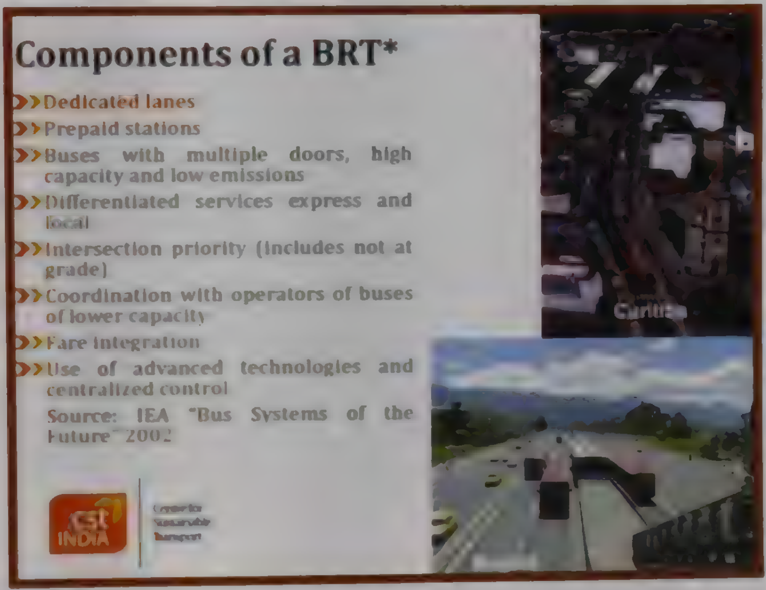


DEDICATED LANES

- Bus tunnel: Seattle, Boston, Brisbane
- Exclusive bus lane (completely segregated or "bus only"): Charlotte, Hardford, Miami, Ottawa, Pittsburgh, Adelaide, Brisbane, Sydney, Ruancom
- Highway lanes: Houston, Los Ángeles, Nueva York, Istanbul
- Central lanes on exclusive arteries: Cleveland, Eugene, Belo Horizonte, Bogotá, Curitiba, Porto Alegre, Quito, Guayaquil, Santiago, Mexico, Sao Paulo, Ahmedabad, Guadalajara
- Bus lanes: Ottawa, Pittsburg, Vancouver, Rouen (Francia), Barcelona, Madrid
- Mixed traffic: Honolulu, Los Ángeles, Vancouver, Leeds (queue jumpers)



Bus tunnel Seattle Washington (dual buses, operate with electricity in tunnel)
Open since september 1990, has 1,2 miles and cost US$444 MM



Components of a BRT*

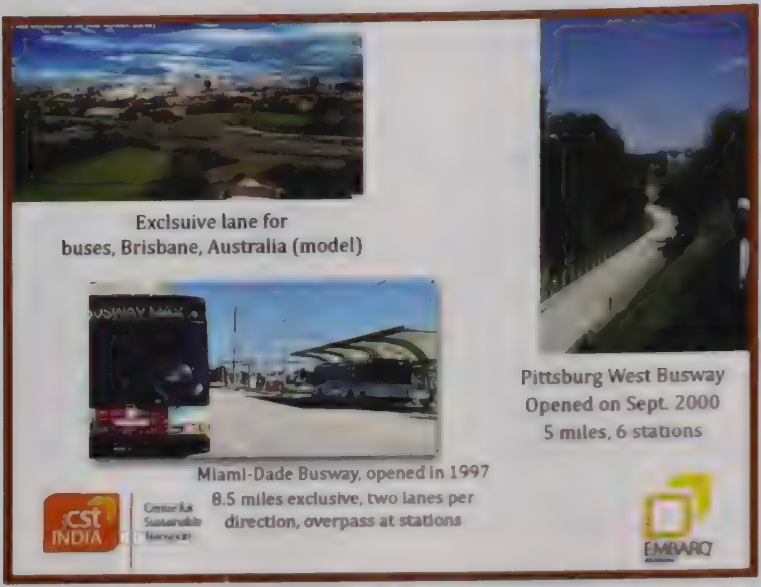
- Dedicated lanes
- Prepaid stations
- Buses with multiple doors, high capacity and low emissions
- Differentiated services express and local
- Intersection priority (includes not at grade)
- Coordination with operators of buses of lower capacity
- Fare integration
- Use of advanced technologies and centralized control

Source: IEA "Bus Systems of the Future" 2002

Elevetad Track, ExpressoTiradentes Sao Paulo, Brazil

Photo: Karl Fjellstrom - ITDP

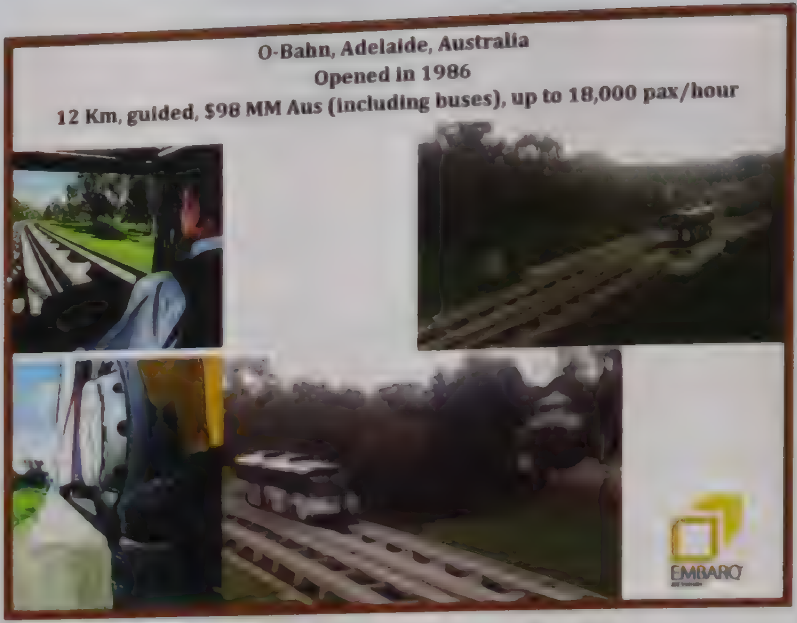
Xiamen BRT
(2008)



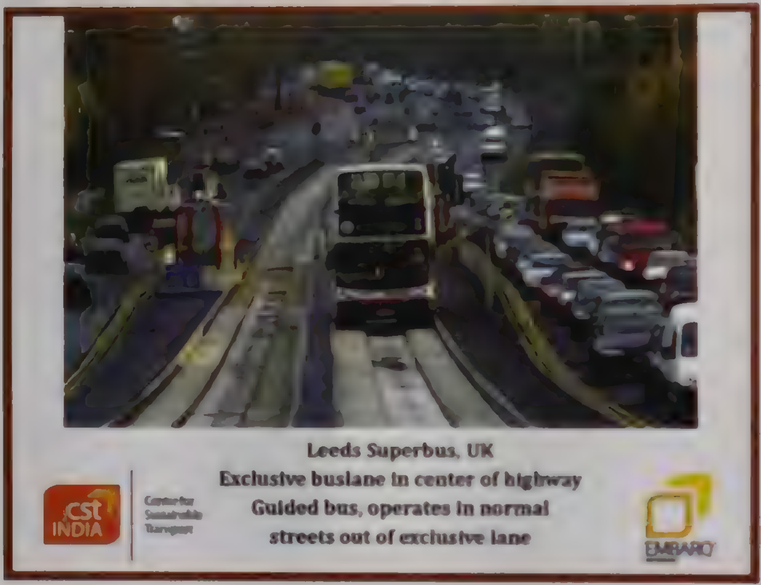
Exclsuive lane for
buses, Brisbane, Australia (model)

Pittsburg West Busway
Opened on Sept. 2000
5 miles, 6 stations

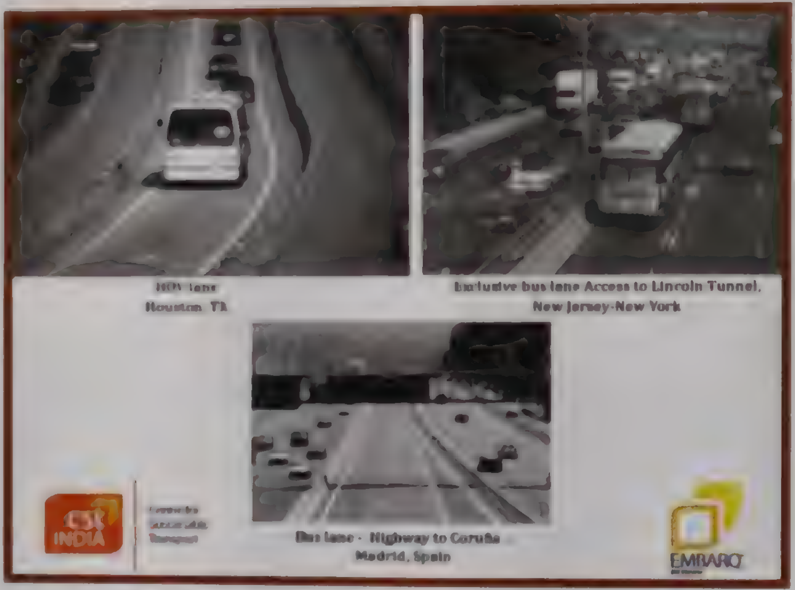
Miami-Dade Busway, opened in 1997
8.5 miles exclusive, two lanes per
direction, overpass at stations



O-Bahn, Adelaide, Australia
Opened in 1986
12 Km, guided, $98 MM Aus (including buses), up to 18,000 pax/hour



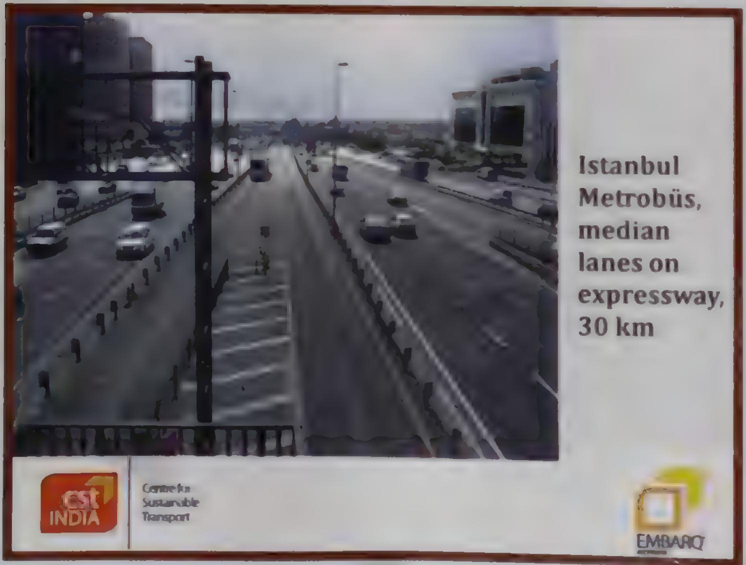
Leeds Superbus, UK
Exclusive buslane in center of highway
Guided bus, operates in normal
streets out of exclusive lane



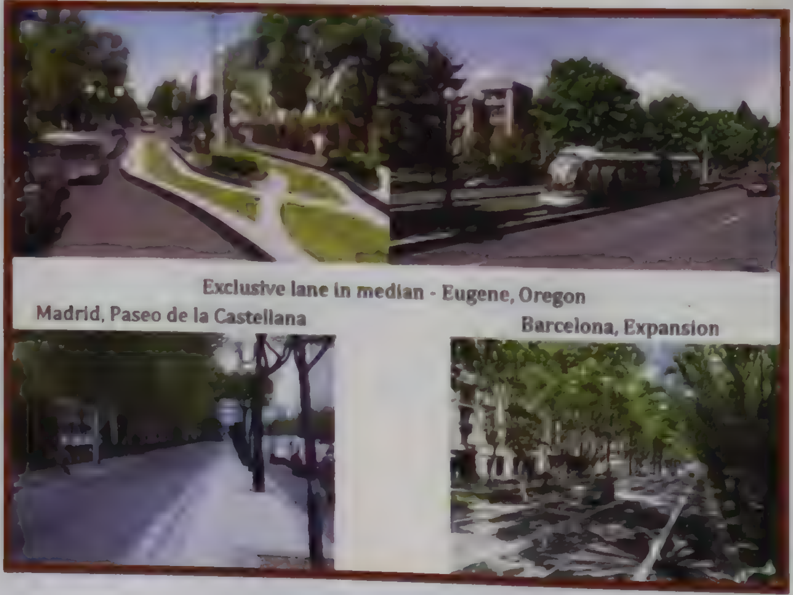
HOV lane
Houston, TX

Exclusive bus lane Access to Lincoln Tunnel,
New Jersey-New York

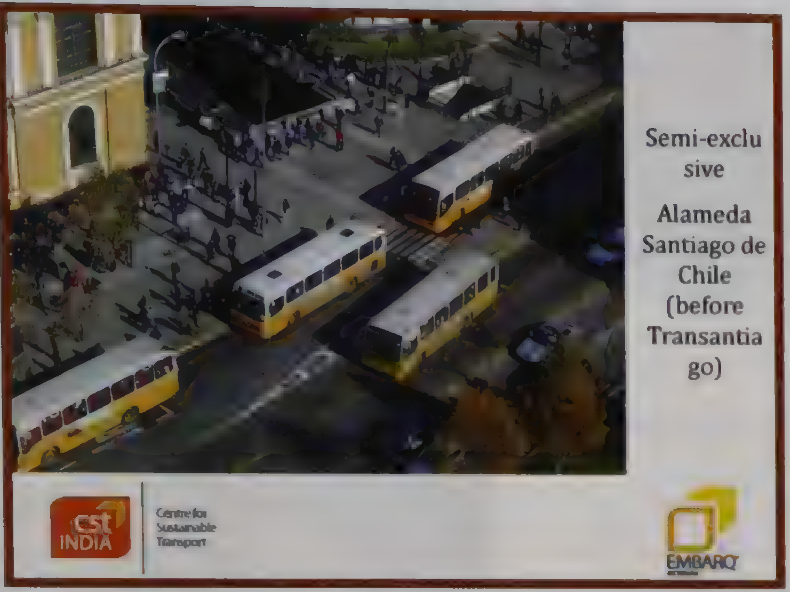
Bus lane - Highway to Coruña
Madrid, Spain



Istanbul
Metrobüs,
median
lanes on
expressway,
30 km



Exclusive lane in median - Eugene, Oregon
Madrid, Paseo de la Castellana
Barcelona, Expansion



Semi-exclusive

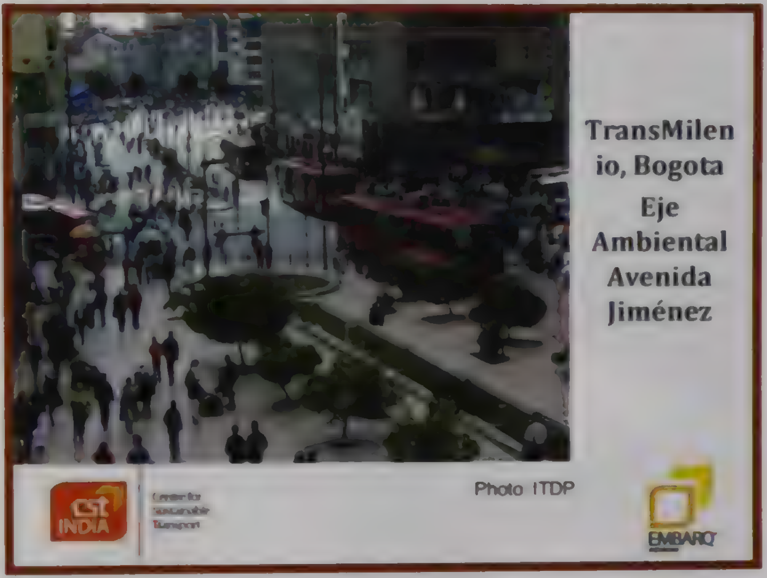
Alameda Santiago de Chile (before Transantiago)

TransMilenio

Bogota

Passing Lanes at Stations

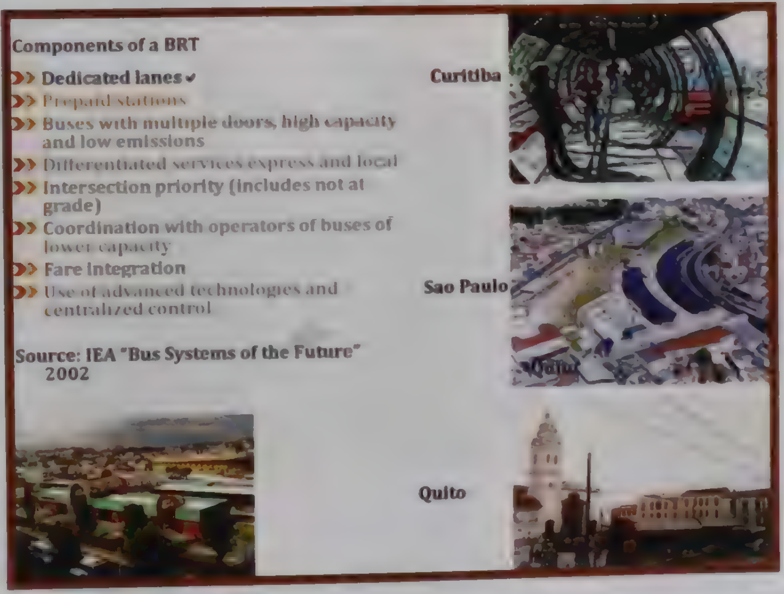
Expressway Lanes, TransMilenio, Bogota



TransMilenio, Bogota

Eje Ambiental Avenida Jiménez

Photo: ITDP



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- Differentiated services express and local
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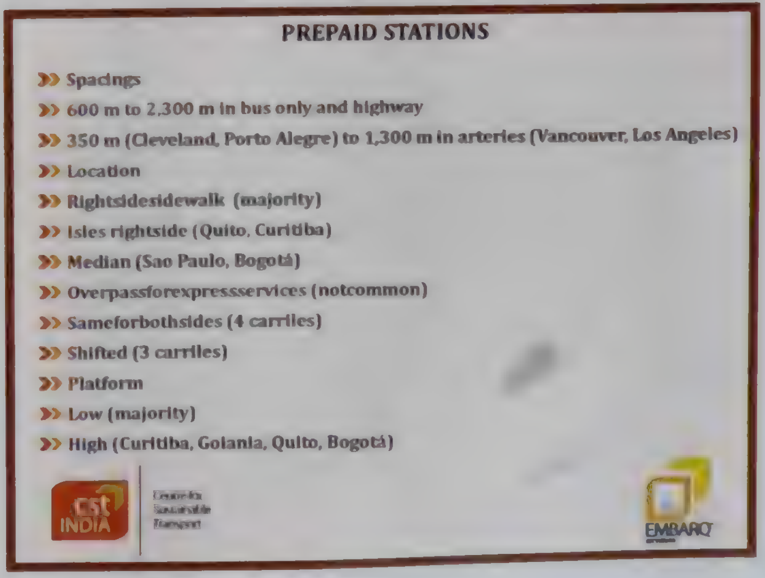
- Coordination with operators of buses of lower capacity
- Fare integration
- Use of advanced technologies and centralized control

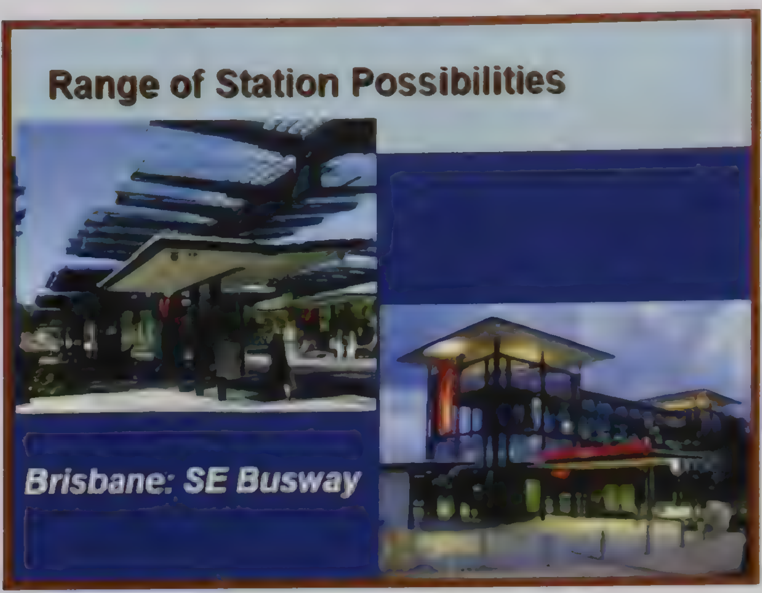
Source: IEA "Bus Systems of the Future" 2002

Curitiba
Sao Paulo
Quito



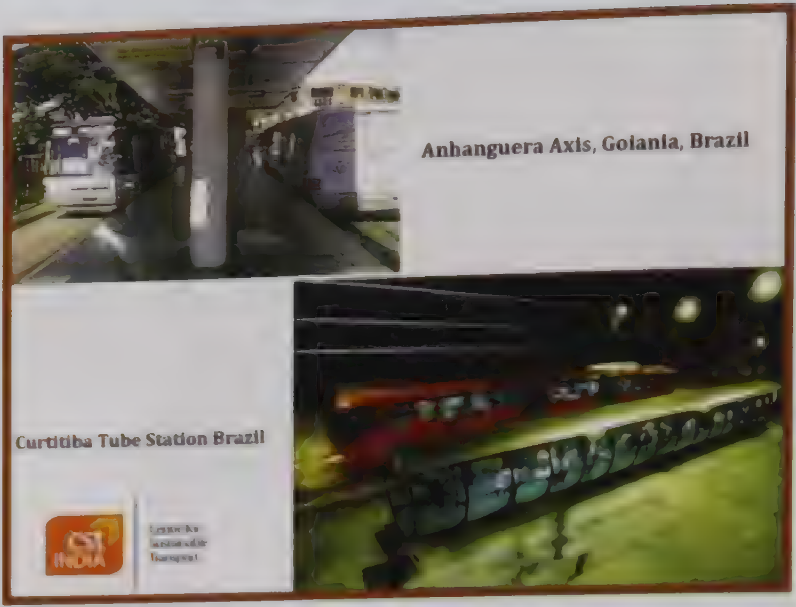
PREPAID STATIONS

- Spacings
- 600 m to 2,300 m in bus only and highway
- 350 m (Cleveland, Porto Alegre) to 1,300 m in arteries (Vancouver, Los Angeles)
- Location
- Rightsidesidewalk (majority)
- Isles rightside (Quito, Curitiba)
- Median (Sao Paulo, Bogotá)
- Overpassforexpressservices (notcommon)
- Sameforbothsides (4 carriles)
- Shifted (3 carriles)
- Platform
- Low (majority)
- High (Curitiba, Goiania, Quito, Bogotá)



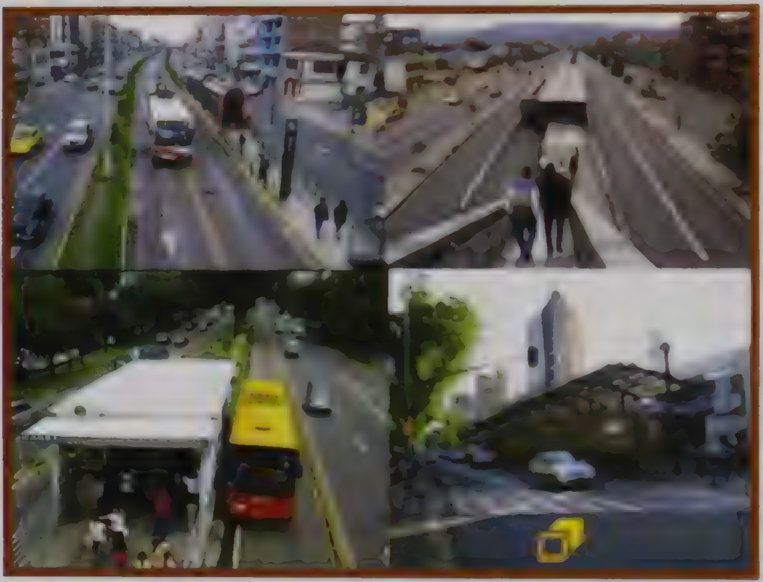
Range of Station Possibilities

Brisbane: SE Busway



Anhanguera Axis, Goiania, Brazil

Curtitiba Tube Station Brazil



Guayaquil, Ecuador

TransMilenio, Bogota
Avenida Caracas

Long Stations allow for two buses docking simultaneously, have prepayment (mostly), and are designed for level access

Terminals

Sto Amaro Terminal, Sao Paulo, Brasil

Tiradentes Terminal Sao Paulo Brasil

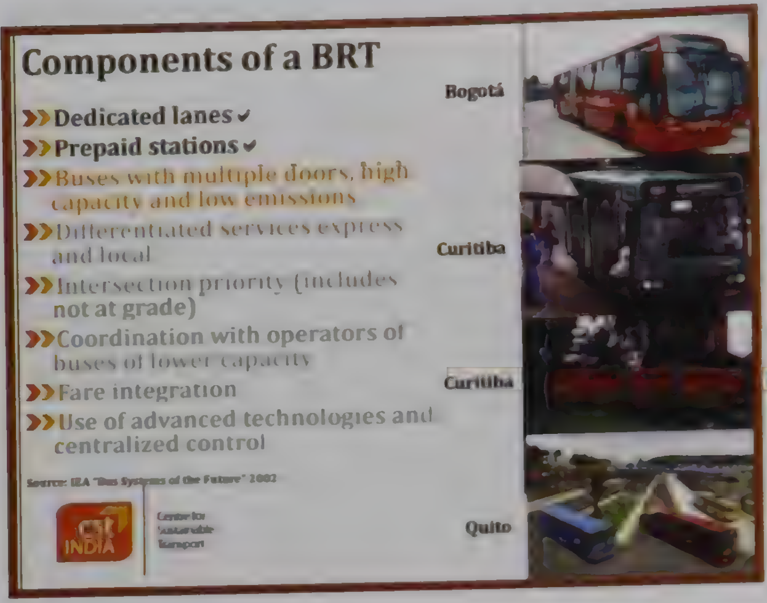
Guayaquil, Ecuador

TransMilenio, Bogota

TransMilenio, Bogota

Metrobus, Mexico

Metrobus, Mexico



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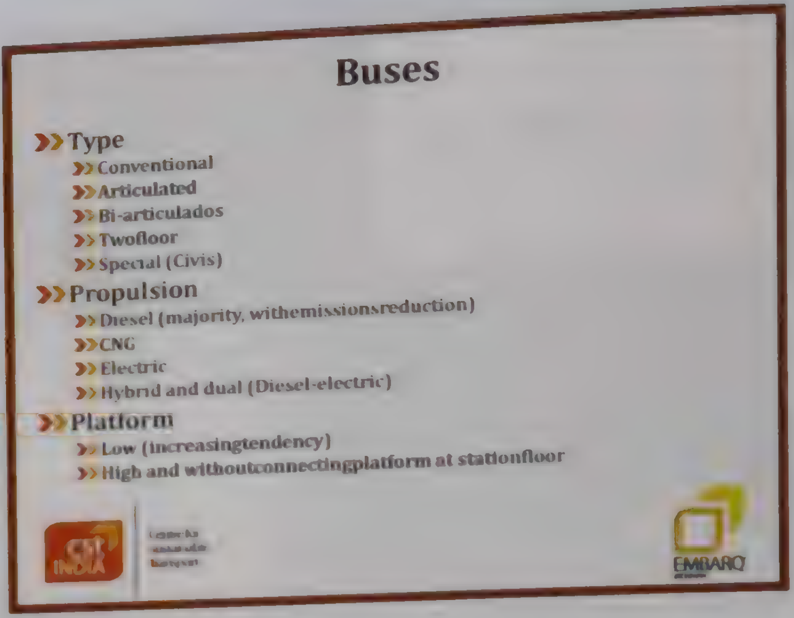
Bogotá
Curitiba
Curitiba
Quito



Buses

- Type
  - Conventional
  - Articulated
  - Bi-articulados
  - Twofloor
  - Special (Civis)
- Propulsion
  - Diesel (majority, withemissionsreduction)
  - CNG
  - Electric
  - Hybrid and dual (Diesel-electric)
- Platform
  - Low (increasingtendency)
  - High and withoutconnectingplatform at stationfloor

Conventional IVECO Low platform (it kneels)
CNG propulsion, Opera

Conventional Renault Citaro, France
Diesel Euro II

Prototype Advanced Vehicle for public transport ATV - Hydrogen cell, USA

Articuladted Neoplan low platform

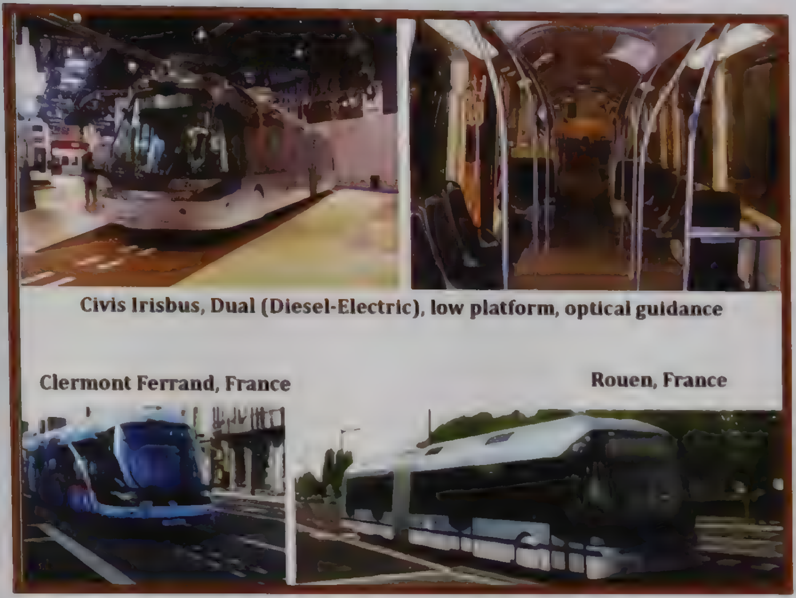
Articulated Renault low platform

Renault Agora L, Clermont Ferrand, France

Van Hool for AC Transit Rapid, San Francisco, EEUU

Mercedes Articulated Low-Floor Istanbul, Turkey

Bi-Articulated Van Hool
Low platform



Civis Irisbus, Dual (Diesel-Electric), low platform, optical guidance

Clermont Ferrand, France

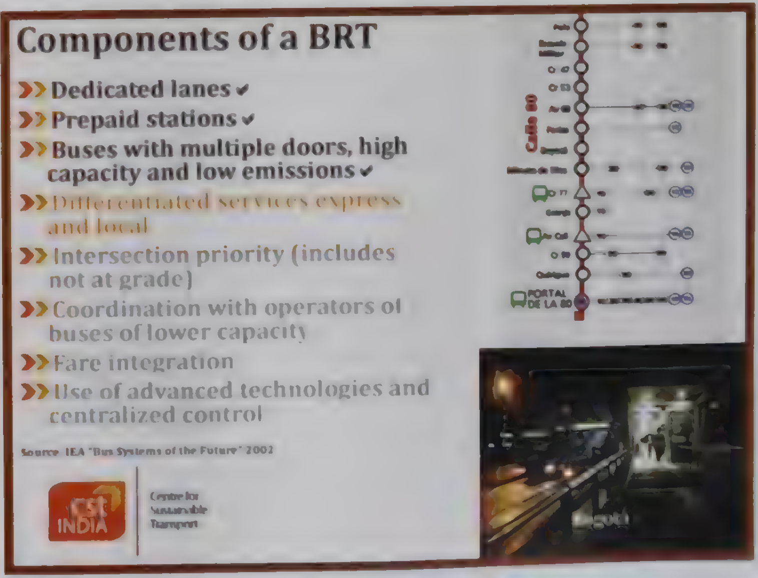
Rouen, France

Phinneas, Van Hool, Double Articulated, Automatic Magnetic Docking Istanbul, Turkey

Double Articulated, TransMilenio, Bogota

Photo: Carlos Pardo, ITDP

Janmarg Ahmedabad, India



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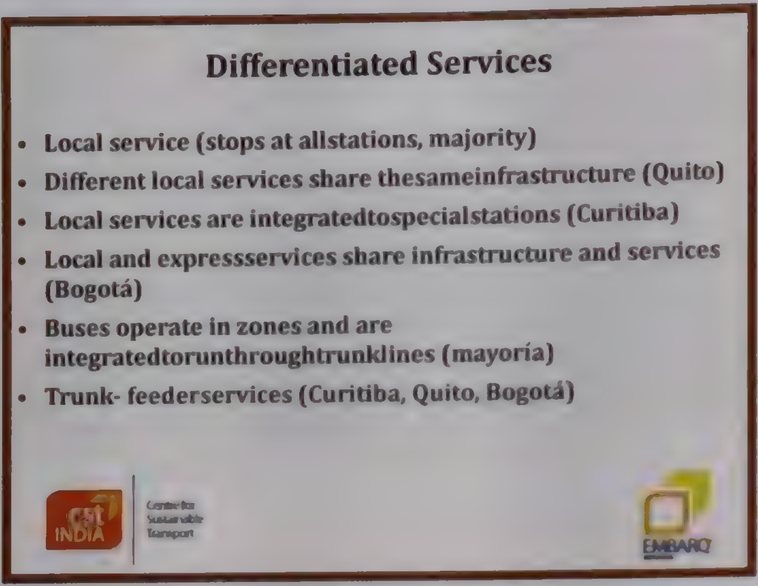


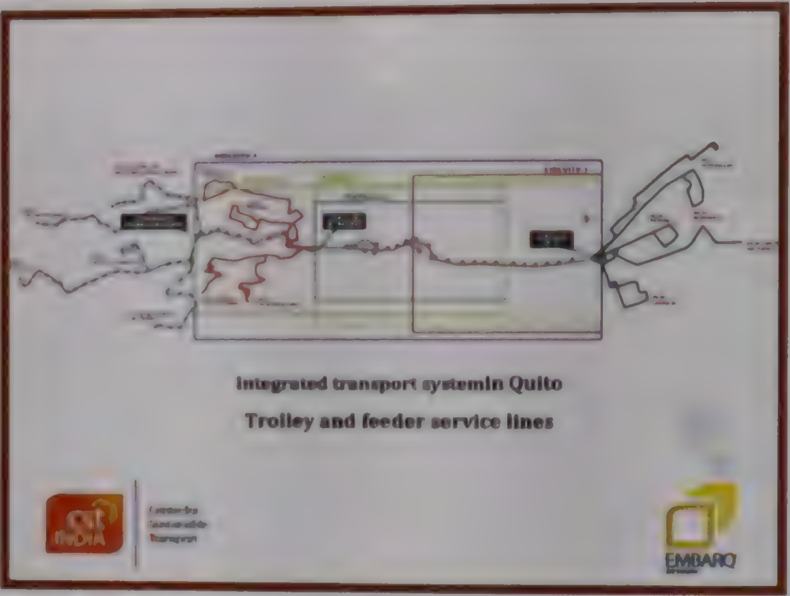
Differentiated Services

- Local service (stops at allstations, majority)
- Different local services share thesameinfrastructure (Quito)
- Local services are integratedtospecialstations (Curitiba)
- Local and expressservices share infrastructure and services (Bogotá)
- Buses operate in zones and are integratedtorunthroughtrunklines (mayoría)
- Trunk- feederservices (Curitiba, Quito, Bogotá)

Integrated transport network in Curitiba, Brasil

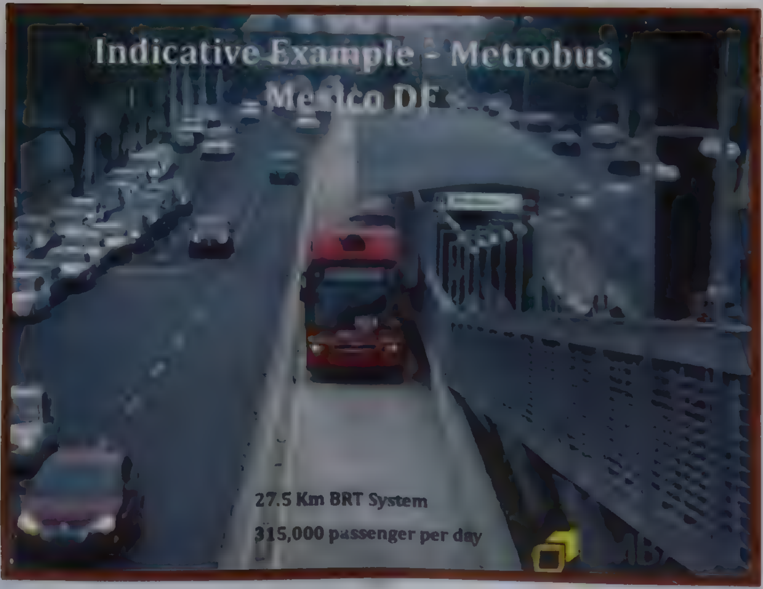
Integrated transport system in Sao Paulo

(Empresa Metropolitana de Transporte Urbano)



Integrated transport systemin Quito

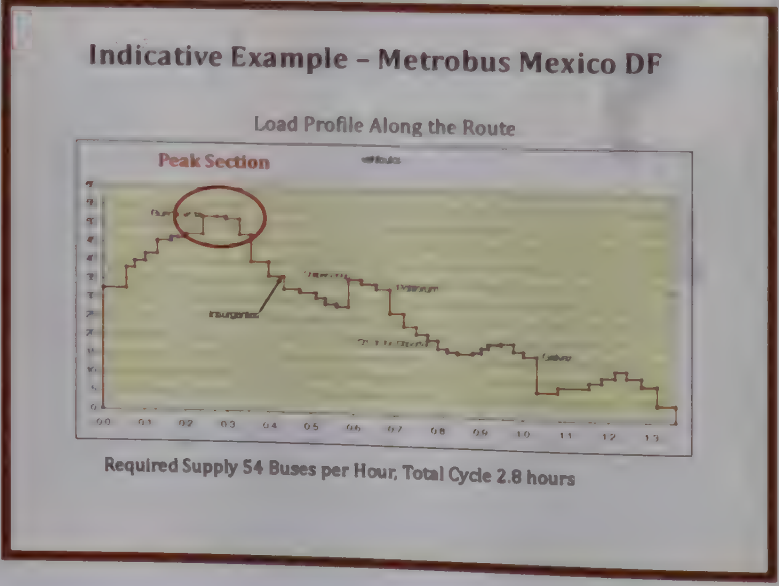
Trolley and feeder service lines



Indicative Example - Metrobus Mexico DF

27.5 Km BRT System

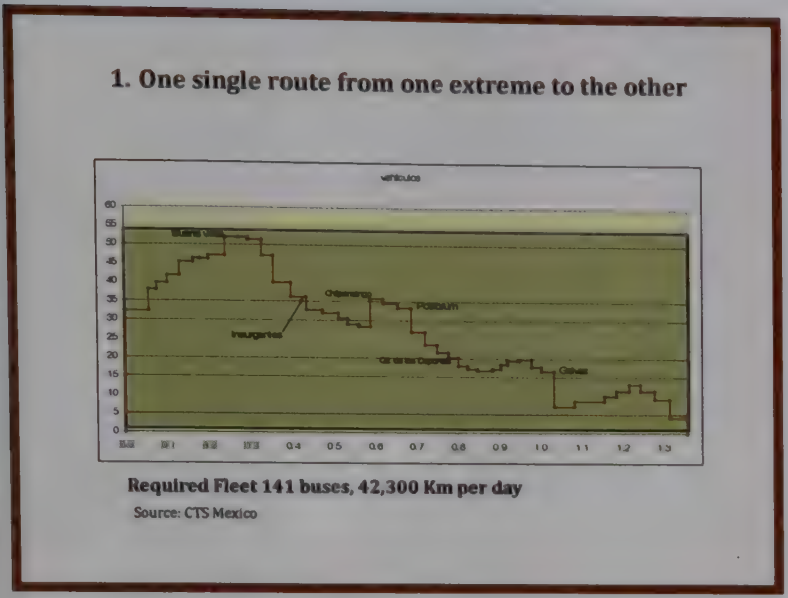
315,000 passenger per day



Indicative Example – Metrobus Mexico DF

Load Profile Along the Route

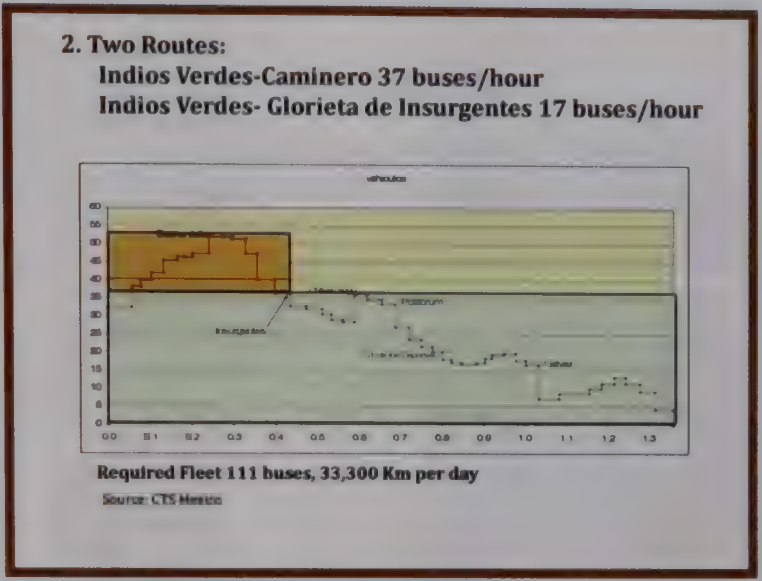
Required Supply 54 Buses per Hour, Total Cycle 2.8 hours



1. One single route from one extreme to the other

Required Fleet 141 buses, 42,300 Km per day

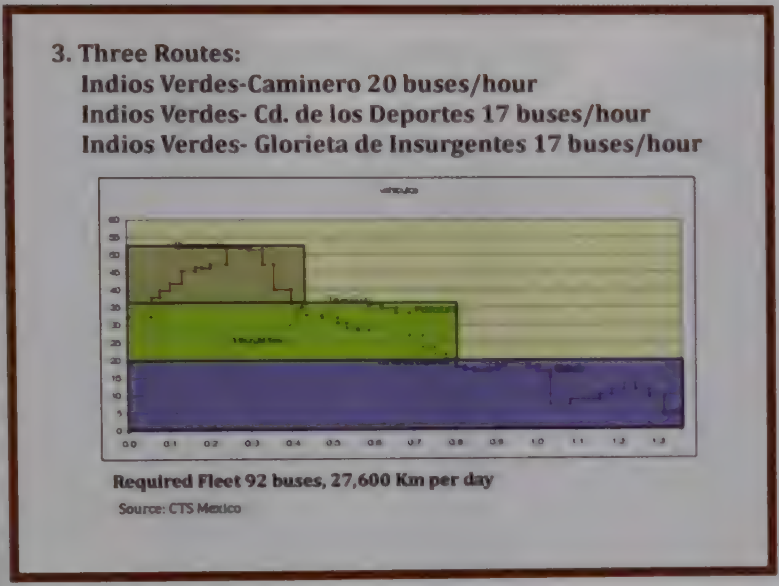
Source: CTS Mexico



2. Two Routes:
Indios Verdes-Caminero 37 buses/hour
Indios Verdes- Glorieta de Insurgentes 17 buses/hour

Required Fleet 111 buses, 33,300 Km per day

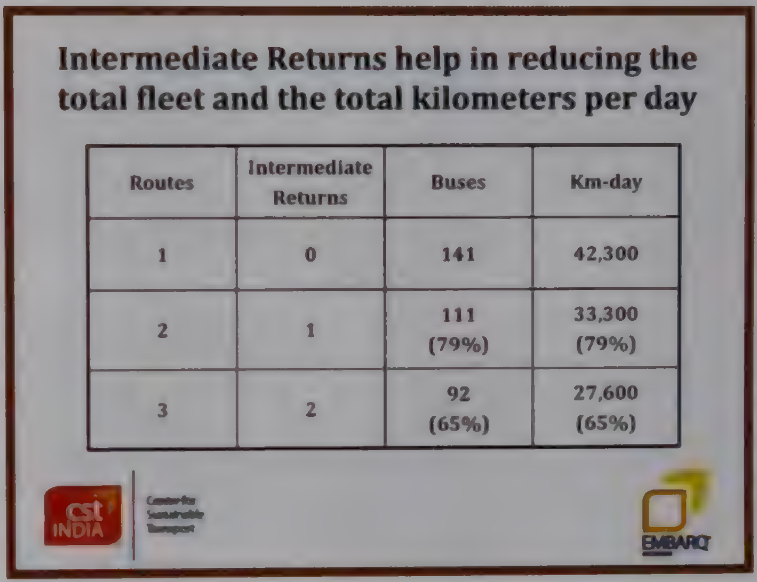
Source: CTS Mexico



3. Three Routes:
Indios Verdes-Caminero 20 buses/hour
Indios Verdes- Cd. de los Deportes 17 buses/hour
Indios Verdes- Glorieta de Insurgentes 17 buses/hour

Required Fleet 92 buses, 27,600 Km per day

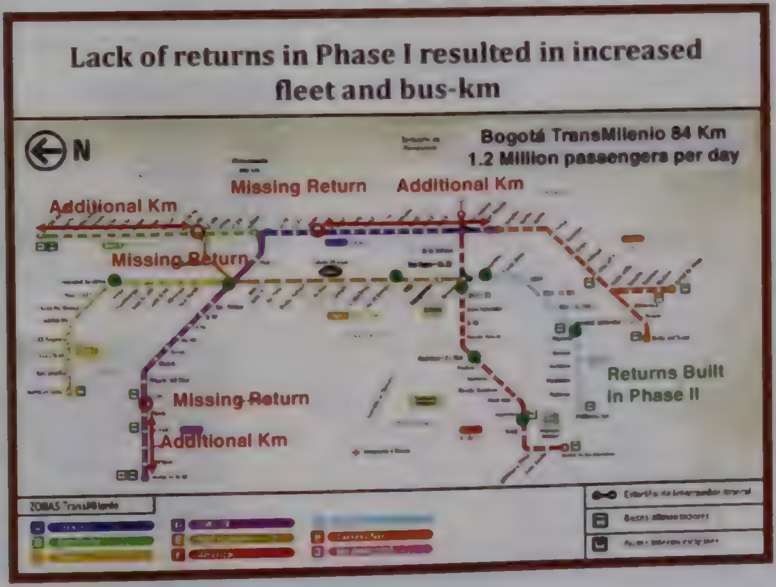
Source: CTS Mexico



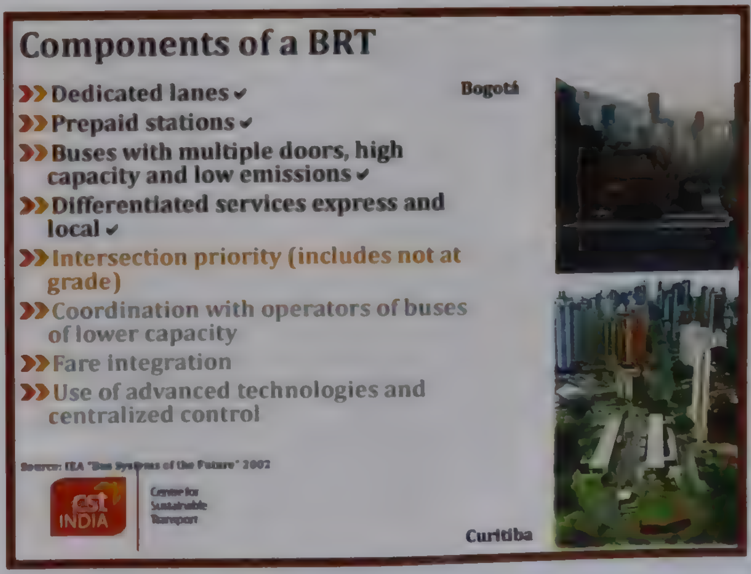
Intermediate Returns help in reducing the total fleet and the total kilometers per day

Routes	Intermediate Returns	Buses	Km-day
1	0	141	42,300
2	1	111 (79%)	33,300 (79%)
3	2	92 (65%)	27,600 (65%)

cst INDIA
Centre for Sustainable Transport
EMBARQ



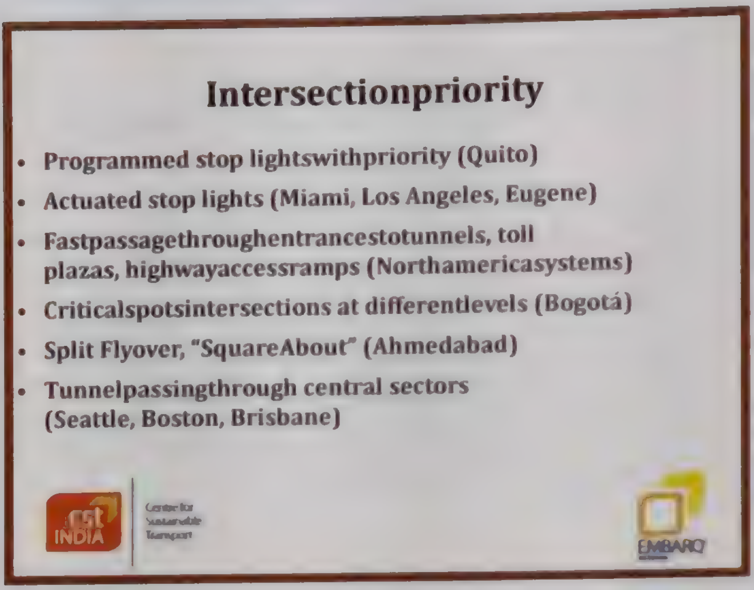
Lack of returns in Phase I resulted in increased fleet and bus-km



Components of a BRT

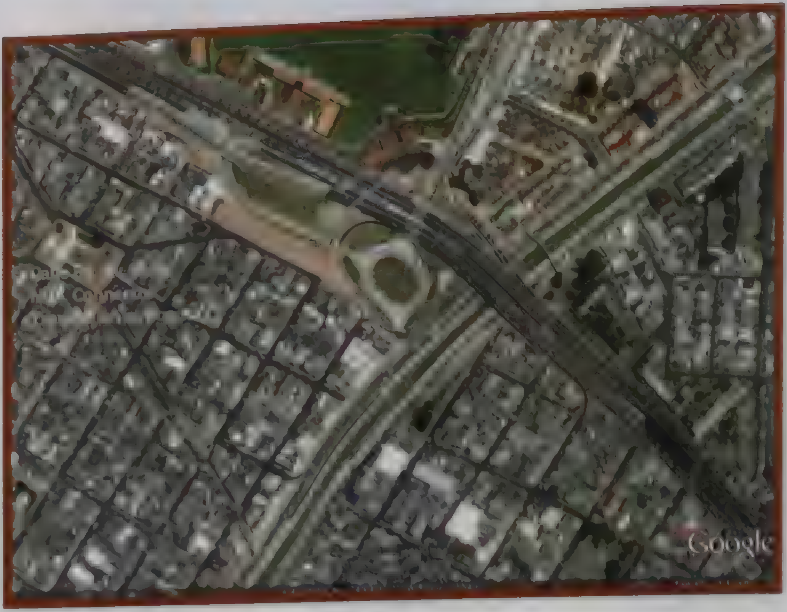
- Dedicated lanes ✓
- Prepaid stations ✓
- Buses with multiple doors, high capacity and low emissions ✓
- Differentiated services express and local ✓
- Intersection priority (includes not at grade)
- Coordination with operators of buses of lower capacity
- Fare integration
- Use of advanced technologies and centralized control

Source: IEA "Bus Systems of the Future" 2002



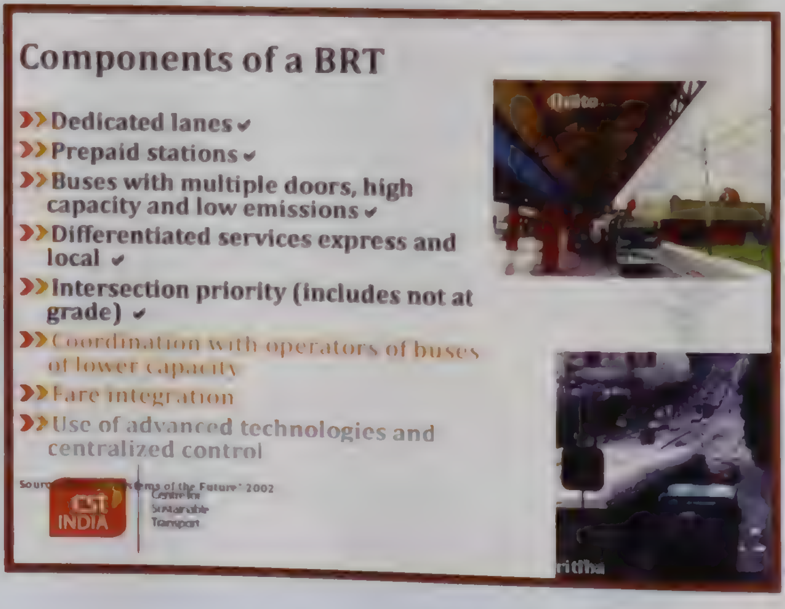
Intersectionpriority

- Programmed stop lightswithpriority (Quito)
- Actuated stop lights (Miami, Los Angeles, Eugene)
- Fastpassagethroughentrancestotunnels, toll plazas, highwayaccessramps (Northamericasystems)
- Criticalspotsintersections at differentlevels (Bogotá)
- Split Flyover, "SquareAbout" (Ahmedabad)
- Tunnelpassingthrough central sectors (Seattle, Boston, Brisbane)



Split Flyover, Ahmedaba

Delhi Bus Corridor



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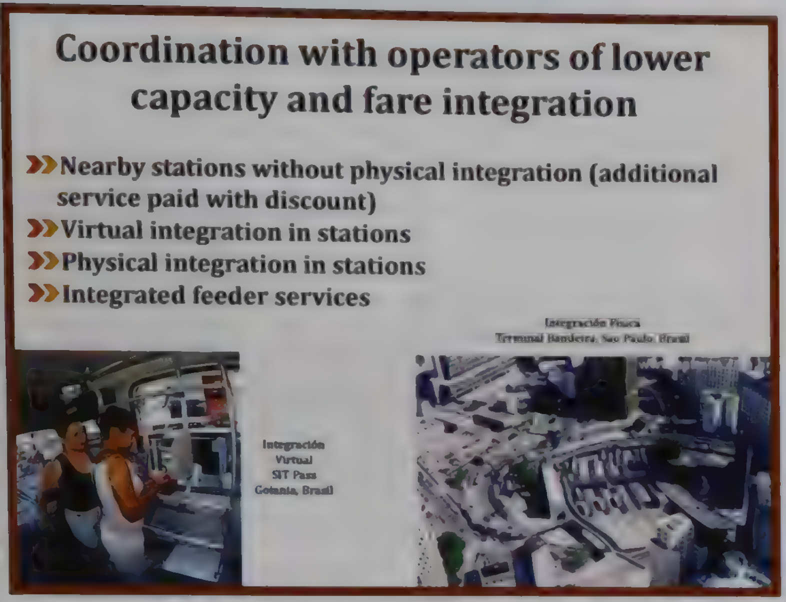
Sour [illegible] tems of the Future" 2002

Quito
ritiba

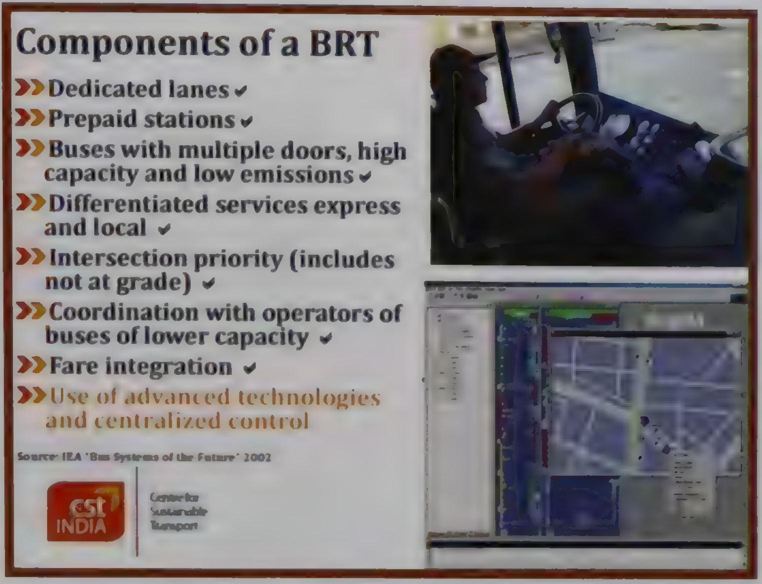


Coordination with operators of lower capacity and fare integration

- Nearby stations without physical integration (additional service paid with discount)
- Virtual integration in stations
- Physical integration in stations
- Integrated feeder services

Integración Física
Terminal Bandeira, Sao Paulo, Brasil

Integración
Virtual
SIT Pass
Goiania, Brasil



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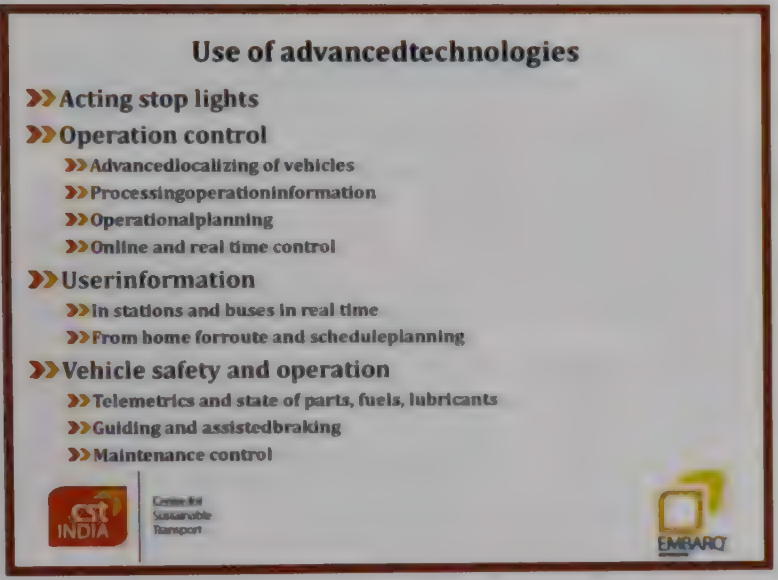
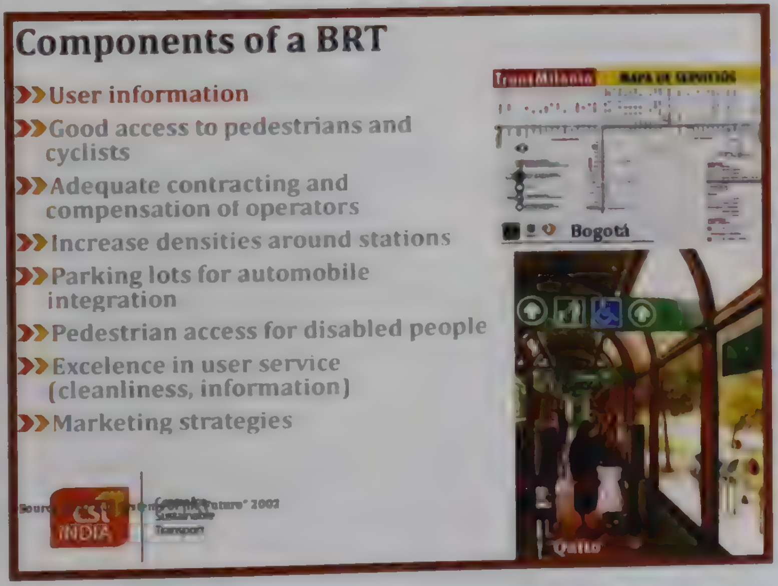
Source: IEA 'Bus Systems of the Future' 2002



Use of advancedtechnologies

- Acting stop lights
- Operation control
  - Advancedlocalizing of vehicles
  - Processingoperationinformation
  - Operationalplanning
  - Online and real time control
- Userinformation
  - In stations and buses in real time
  - From home forroute and scheduleplanning
- Vehicle safety and operation
  - Telemetrics and state of parts, fuels, lubricants
  - Guiding and assistedbraking
  - Maintenance control

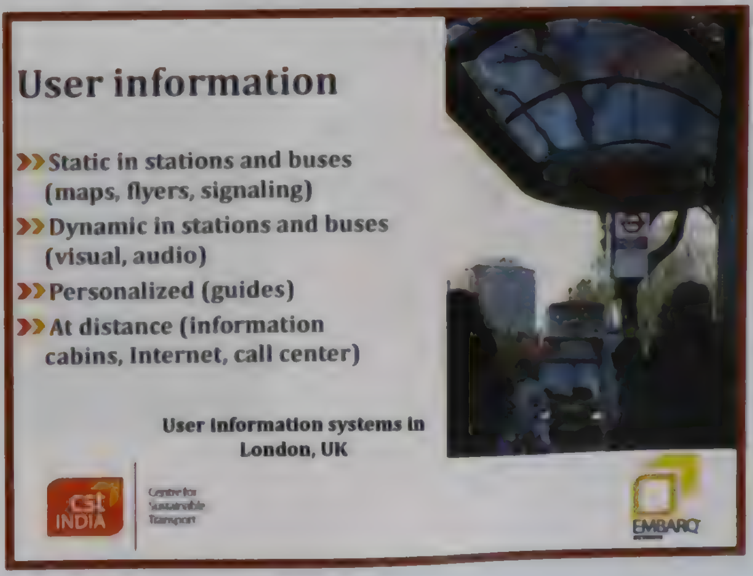
System assistance
EMT - Madrid



Components of a BRT

- User information
- Good access to pedestrians and cyclists
- Adequate contracting and compensation of operators
- Increase densities around stations
- Parking lots for automobile integration
- Pedestrian access for disabled people
- Excelence in user service (cleanliness, information)
- Marketing strategies

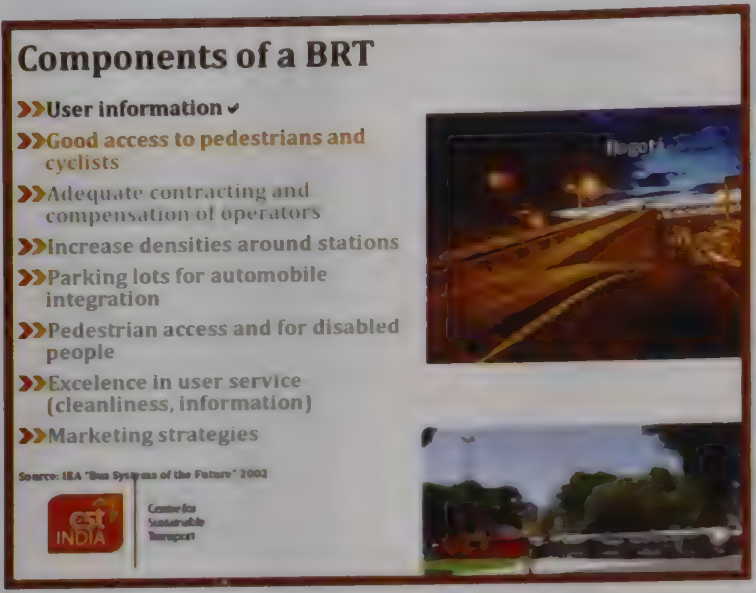
Sourc [illegible] Future' 2002



User information

- Static in stations and buses (maps, flyers, signaling)
- Dynamic in stations and buses (visual, audio)
- Personalized (guides)
- At distance (information cabins, Internet, call center)

User information systems in London, UK



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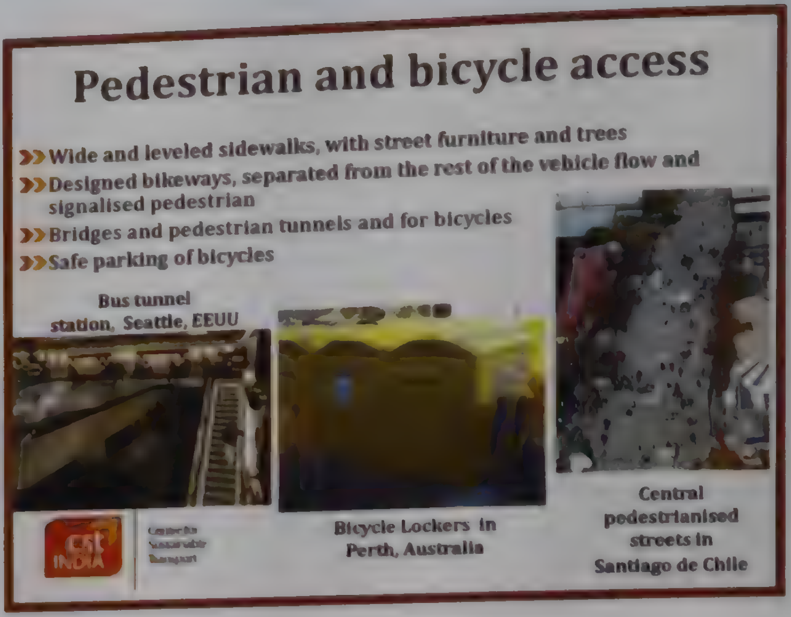


Pedestrian and bicycle access

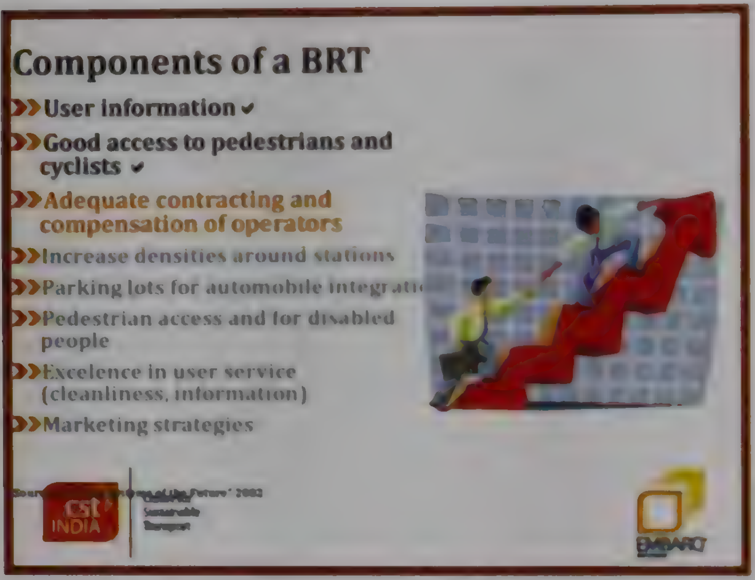
- Wide and leveled sidewalks, with street furniture and trees
- Designed bikeways, separated from the rest of the vehicle flow and signalised pedestrian
- Bridges and pedestrian tunnels and for bicycles
- Safe parking of bicycles

Bus tunnel station, Seattle, EEUU

Bicycle Lockers in Perth, Australia

Central pedestrianised streets in Santiago de Chile

Centre for Sustainable Transport



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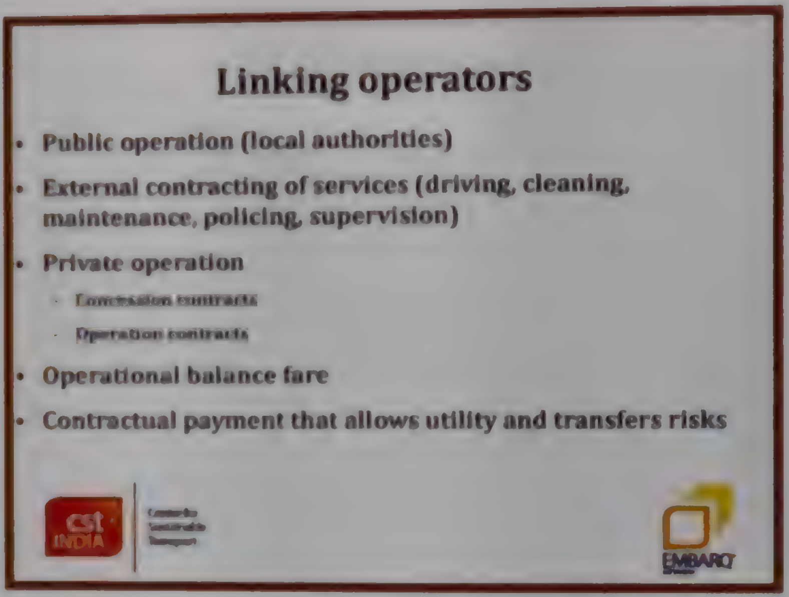
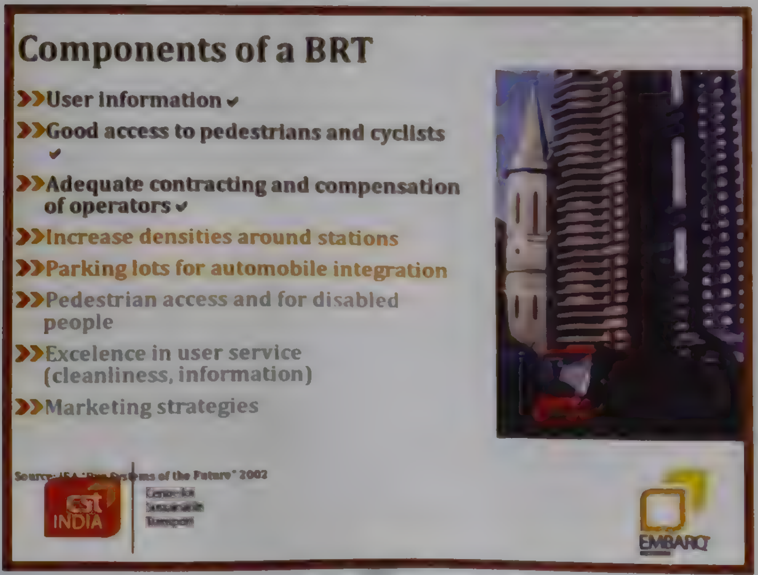


Linking operators

- Public operation (local authorities)
- External contracting of services (driving, cleaning, maintenance, policing, supervision)
- Private operation
  - Concession contracts
  - Operation contracts
- Operational balance fare
- Contractual payment that allows utility and transfers risks

Centre for Sustainable Transport

EMBARQ



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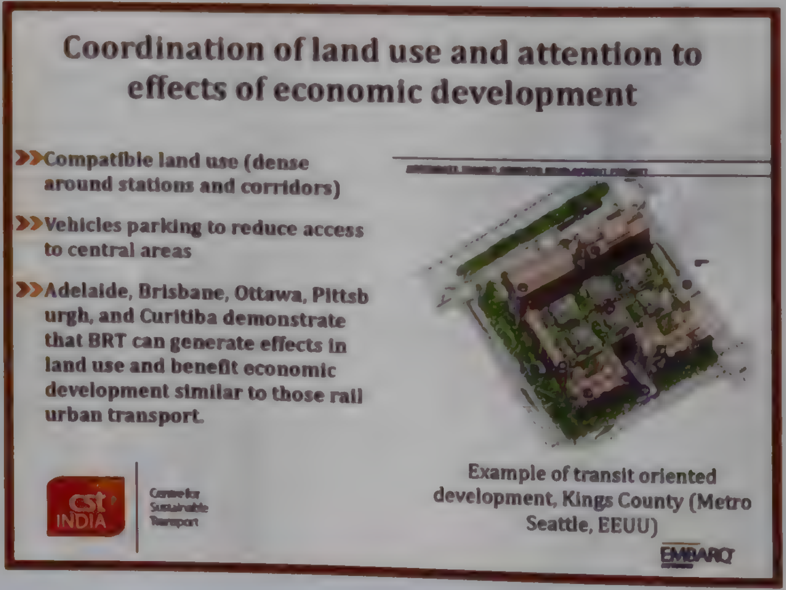

Coordination of land use and attention to effects of economic development

- Compatible land use (dense around stations and corridors)
- Vehicles parking to reduce access to central areas
- Adelaide, Brisbane, Ottawa, Pittsburgh, and Curitiba demonstrate that BRT can generate effects in land use and benefit economic development similar to those rail urban transport.

Example of transit oriented development, Kings County (Metro Seattle, EEUU)

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Boston MBTA Silver Line Phase I

New Mixed Use Development Adjacent to Stations

Boston MBTA Silver Line Phase II

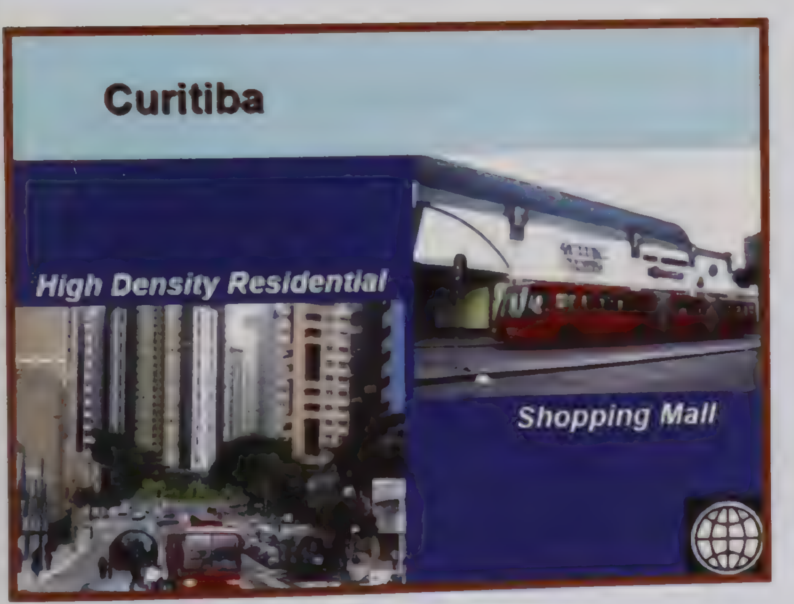
New Mixed Use Development Adjacent to Stations

Denver 16th St. Mall: Generally credited as turning Denver's CBD around after decades of decline

New Retail, Entertainment Venues

Ottawa Transitways: About $1 Billion (Cdn) in Development around stations in BRT system's first 10 years

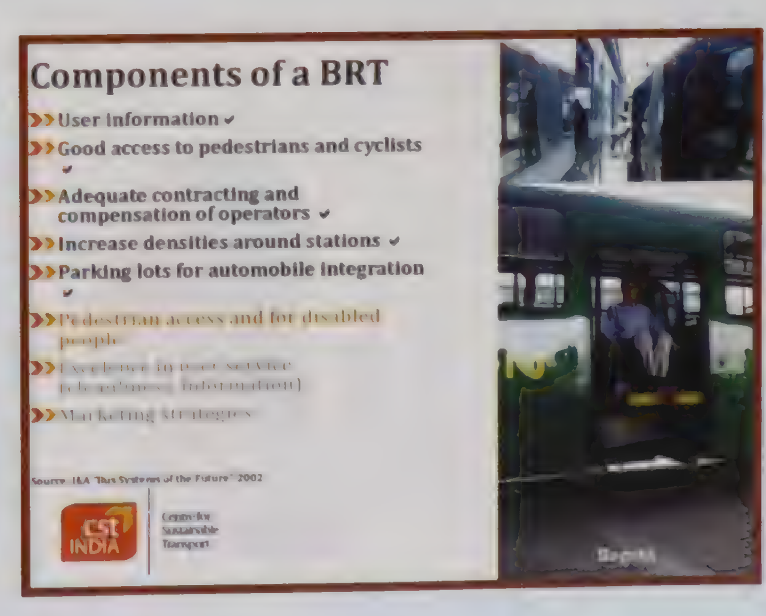
Mixed Use



Curitiba

High Density Residential

Shopping Mall



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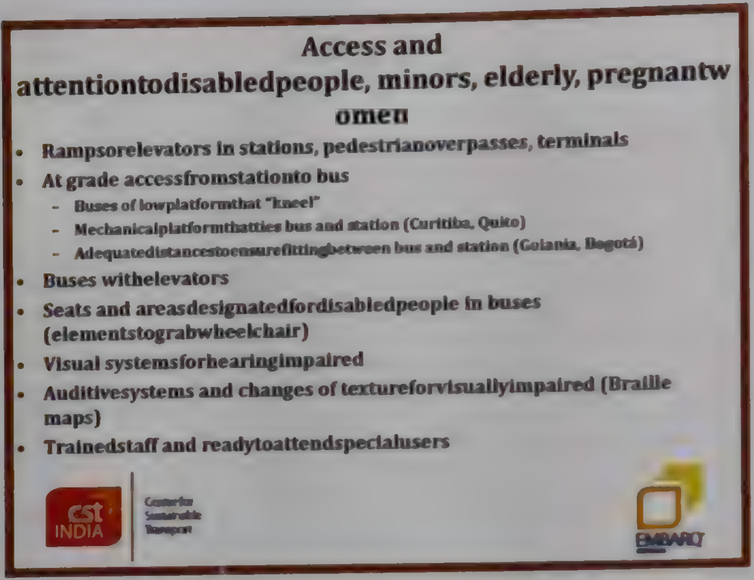
- Excellence in user service (cleanliness, information)
- Marketing strategies

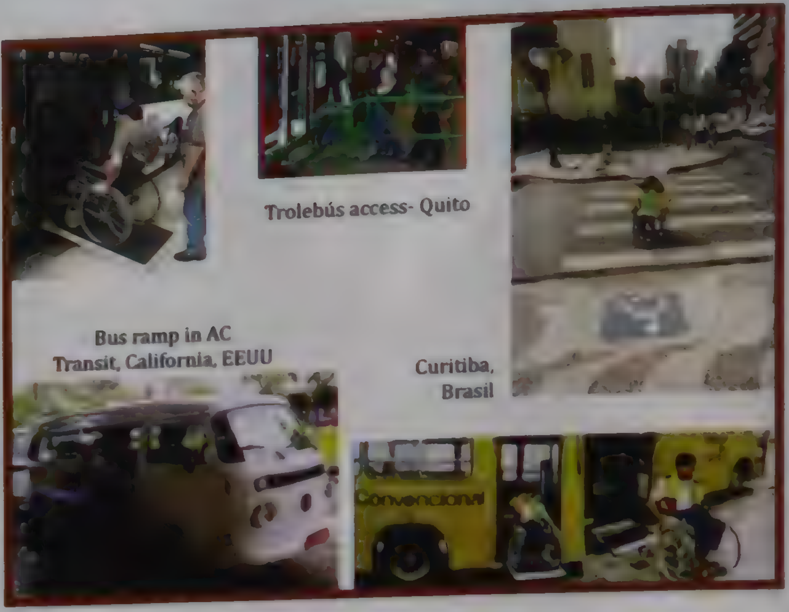
Source: IEA "Bus Systems of the Future" 2002

CST INDIA Centre for Sustainable Transport



Access and attentiontodisabledpeople, minors, elderly, pregnantwomen

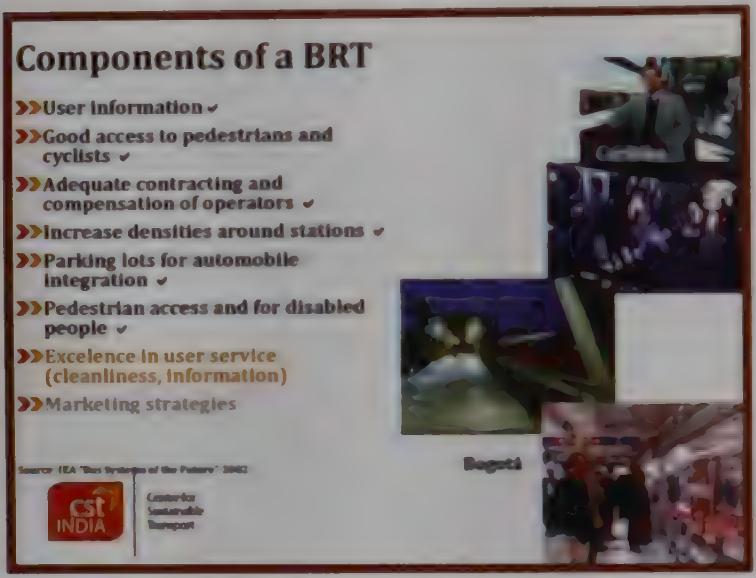
- Rampsorelevators in stations, pedestrianoverpasses, terminals
- At grade accessfromstationto bus
  - Buses of lowplatformthat "kneel"
  - Mechanicalplatformthatties bus and station (Curitiba, Quito)
  - Adequatedistancestoensurefittingbetween bus and station (Goiania, Bogotá)
- Buses withelevators
- Seats and areasdesignatedfordisabledpeople in buses (elementstograbwheelchair)
- Visual systemsforhearingimpaired
- Auditivesystems and changes of textureforvisuallyimpaired (Braille maps)
- Trainedstaff and readytoattendspecialusers



Trolebús access- Quito

Bus ramp in AC Transit, California, EEUU

Curitiba, Brasil



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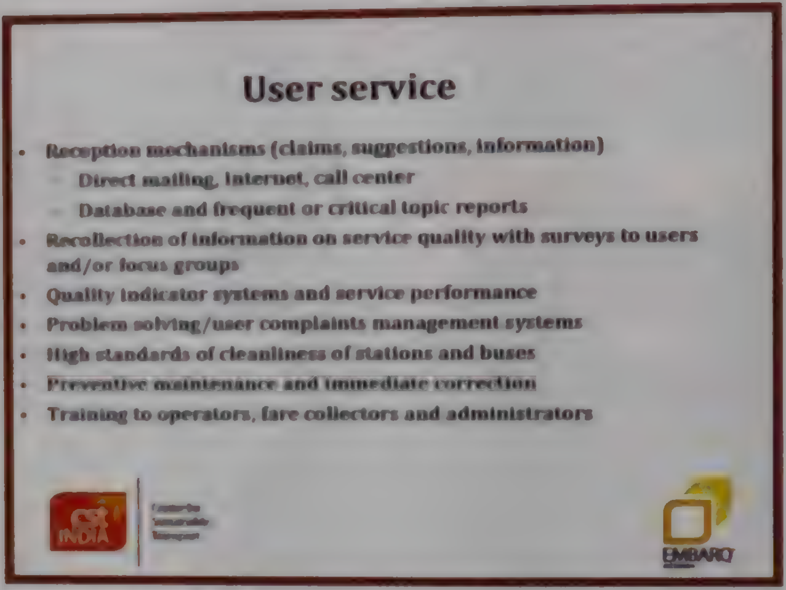
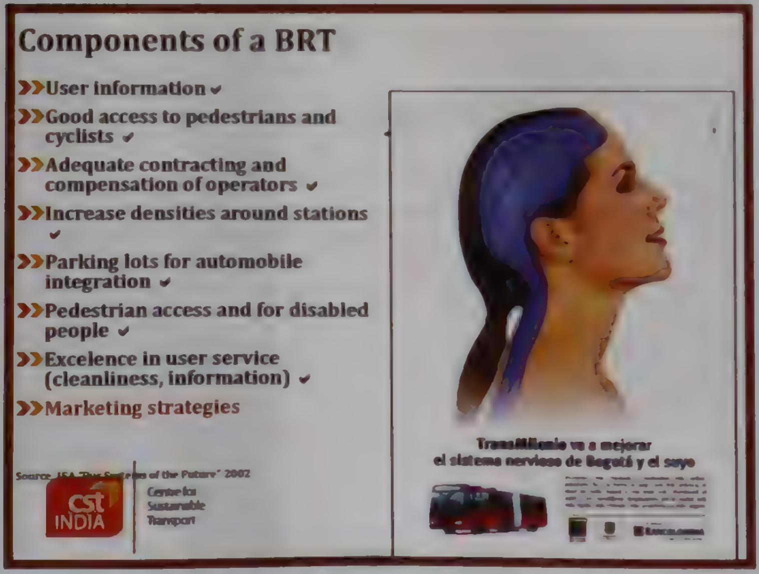
Bogotá



User service

- Reception mechanisms (claims, suggestions, information)
  - Direct mailing, internet, call center
  - Database and frequent or critical topic reports
- Recollection of information on service quality with surveys to users and/or focus groups
- Quality indicator systems and service performance
- Problem solving/user complaints management systems
- High standards of cleanliness of stations and buses
- Preventive maintenance and immediate correction
- Training to operators, fare collectors and administrators



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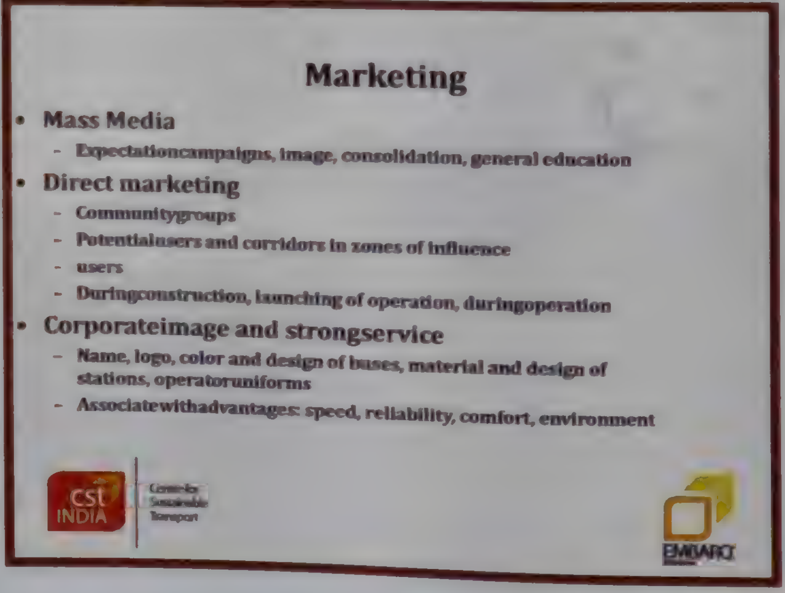
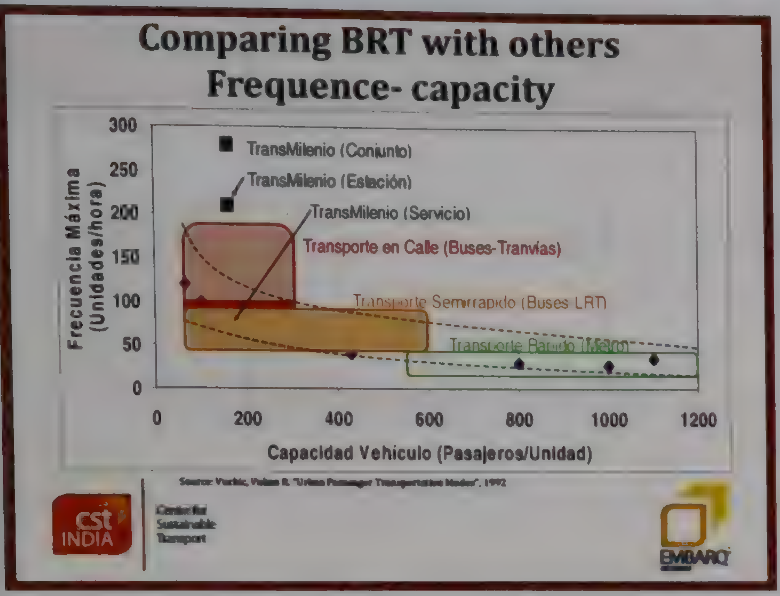
Source: IEA "Bus Systems of the Future" 2002

TransMilenio va a mejorar
el sistema nervioso de Bogotá y el suyo



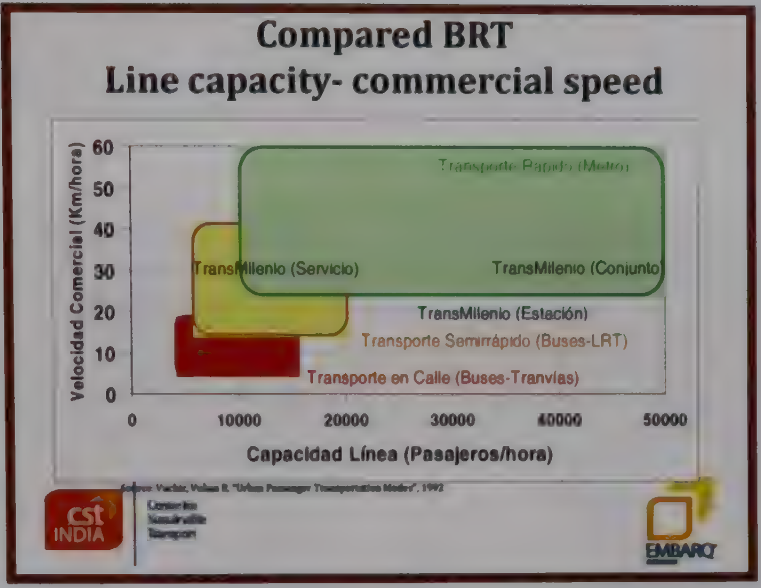
Marketing

- Mass Media
  - Expectationcampaigns, image, consolidation, general education
- Direct marketing
  - Communitygroups
  - Potentialusers and corridors in zones of influence
  - users
  - Duringconstruction, launching of operation, duringoperation
- Corporateimage and strongservice
  - Name, logo, color and design of buses, material and design of stations, operatoruniforms
  - Associatewithadvantages: speed, reliability, comfort, environment



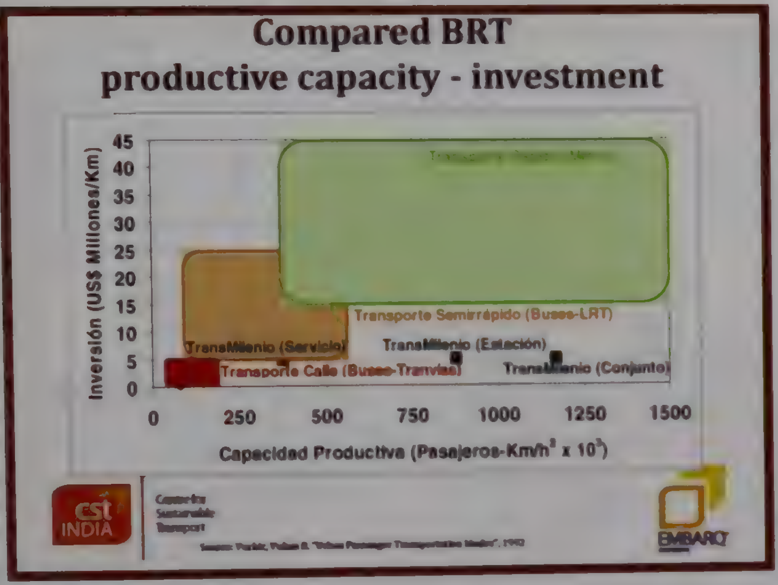
Comparing BRT with others Frequence- capacity

Source: Vuchic, Vukan R. "Urban Passenger Transportation Modes", 1992



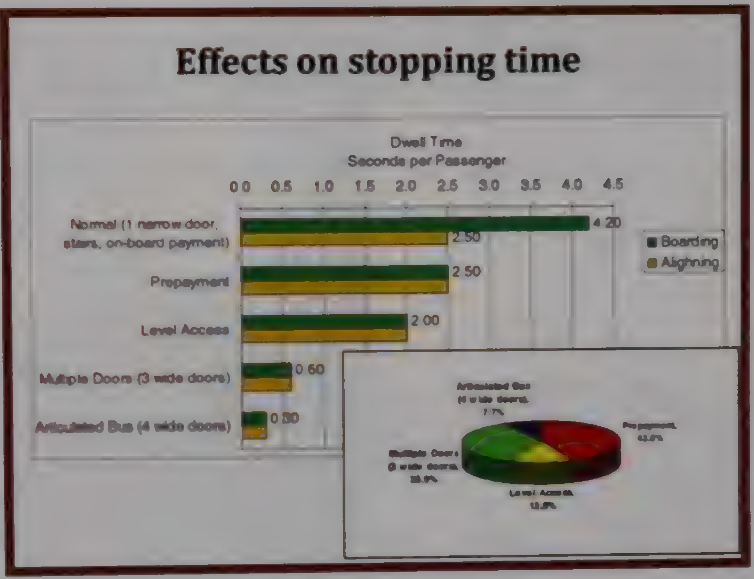
Compared BRT Line capacity- commercial speed

Source: Vuchic, Vukan R. "Urban Passenger Transportation Modes", 1992

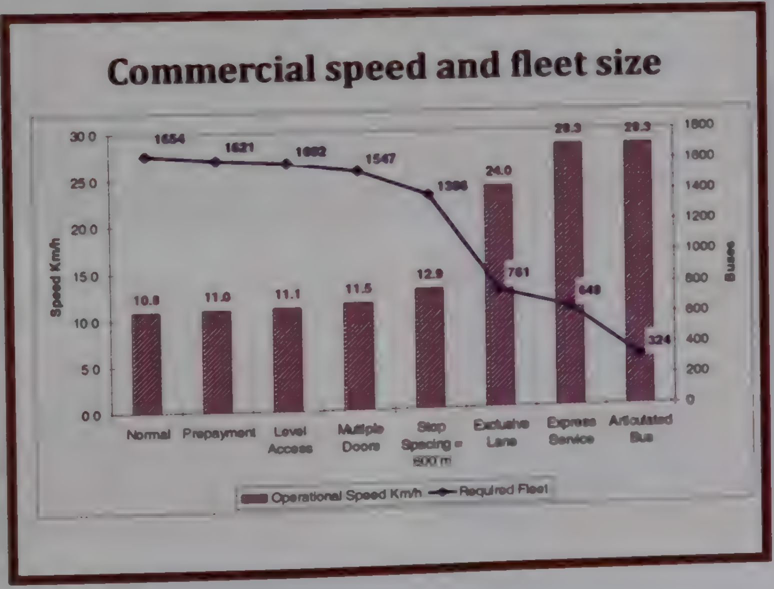


Compared BRT productive capacity - investment

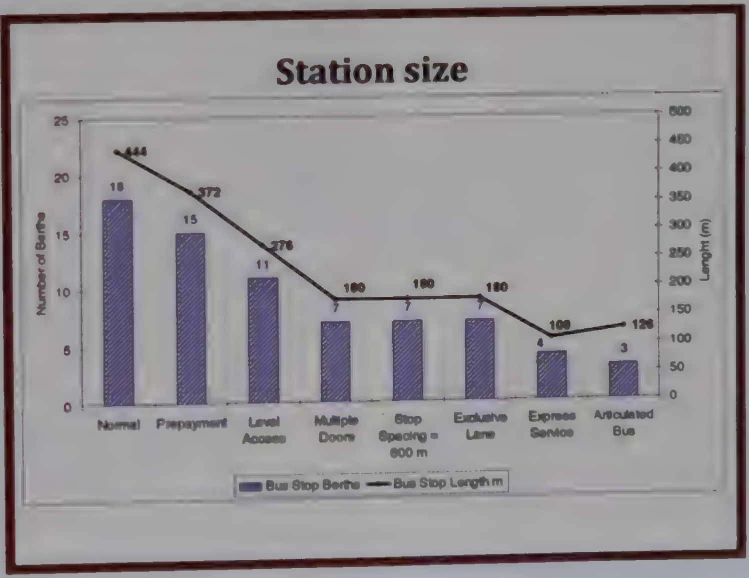
Source: Vuchic, Vukan R. "Urban Passenger Transportation Modes", 1992



Effects on stopping time



Commercial speed and fleet size



Station size

Question and Answer:

Q. In case of Bogota u took lot of public opinion and consultation. How did u gather the public opinion?

Ans: Speaker replied that there are three types of public approaches

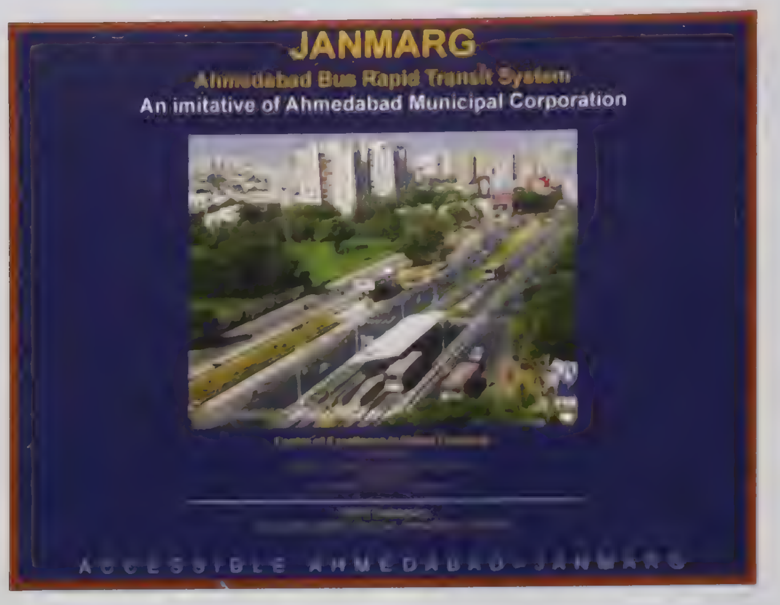
- Informing public about the on goings and the changes in the design /plan
- Involving people in the decision making
- Once the system is in operation get the feedback from the people

Q.Is it good to have BRT on Bangalore Outer Ring Road? (Shri. Vishwanth , BMTC)

Ans.Dr. Dario Hidalgo said it's good to have BRT on any road. He feels that BRT is probably not needed on Outer Ring Road first. BRT should be laid in the CBD areas than in the outer areas.

Session3: Experience of Ahmedabad doing a BRT –

Prof. Shivanand Swamy shared his experience of executing the 'full BRTS' corridor project in Ahmedabad. He brought out the various stages of planning & implementation in his project. He cleared the misconception that is necessary to have wider ROW for executing BRT by providing it in 24 m wide ROW. He also shared his techniques to improve the capacity of existing infrastructure.

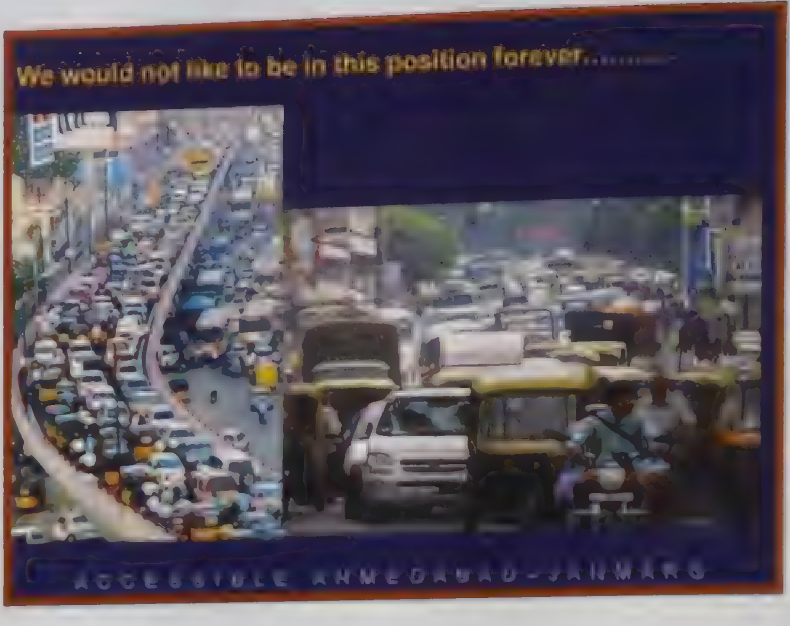


JANMARG

Ahmedabad Bus Rapid Transit System

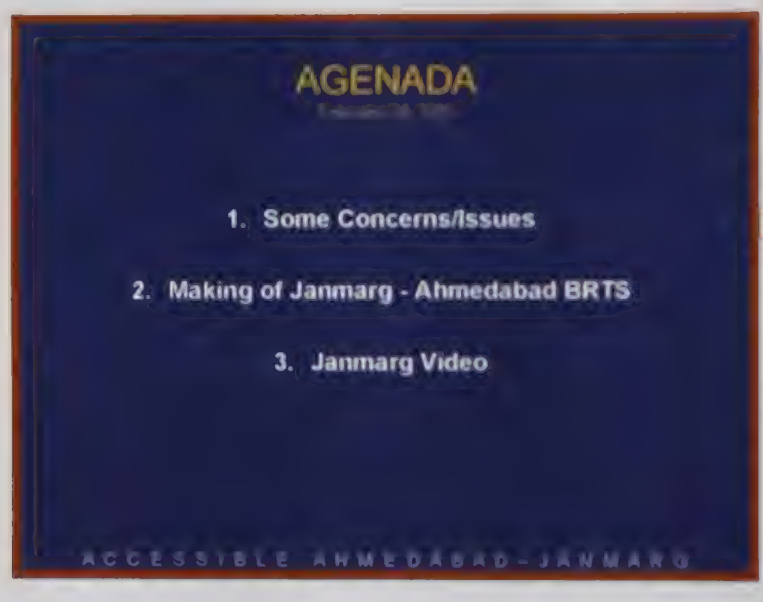
An imitative of Ahmedabad Municipal Corporation

ACCESSIBLE AHMEDABAD – JANMARG



We would not like to be in this position forever………

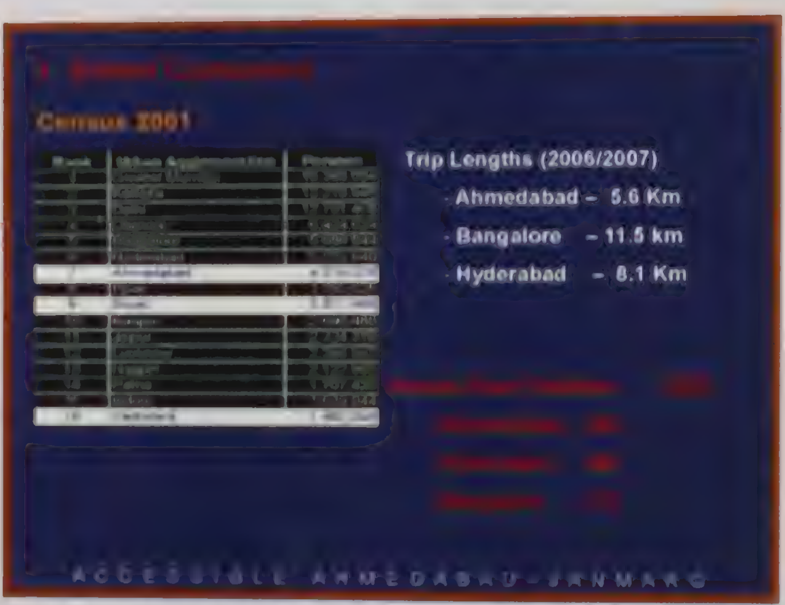
ACCESSIBLE AHMEDABAD – JANMARG



AGENADA

1. Some Concerns/Issues
2. Making of Janmarg - Ahmedabad BRTS
3. Janmarg Video

ACCESSIBLE AHMEDABAD – JANMARG



Census 2001

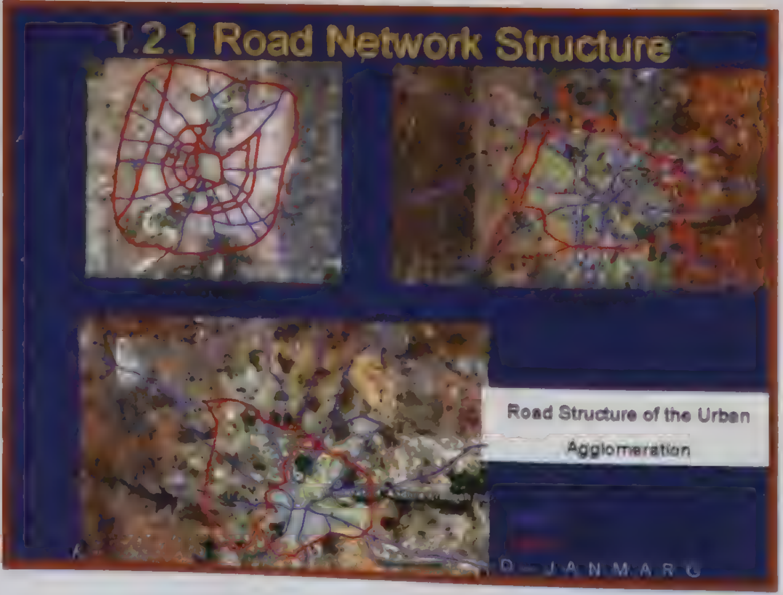
Trip Lengths (2006/2007)

- Ahmedabad – 5.6 Km
- Bangalore – 11.5 km
- Hyderabad – 8.1 Km

ACCESSIBLE AHMEDABAD – JANMARG

1.1 City Structure

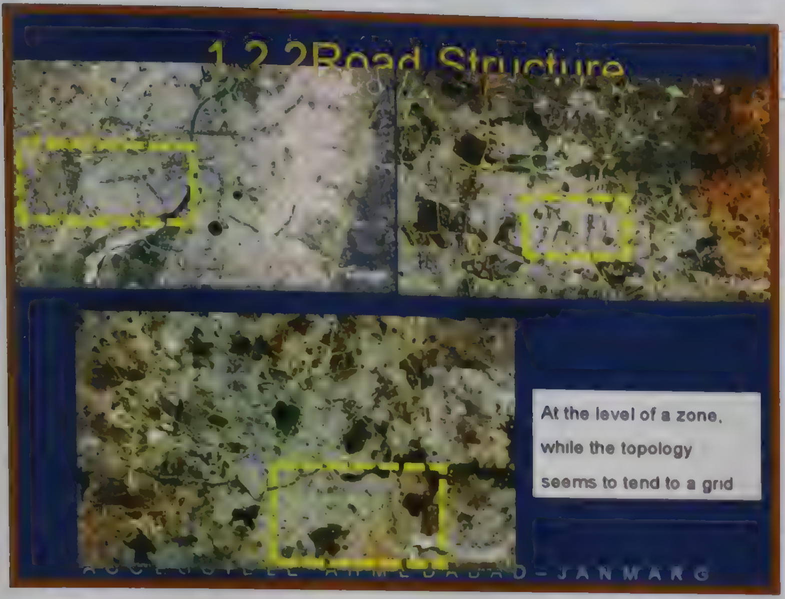
ACCESSIBLE AHMEDABAD – JANMARG



1.2.1 Road Network Structure

Road Structure of the Urban Agglomeration

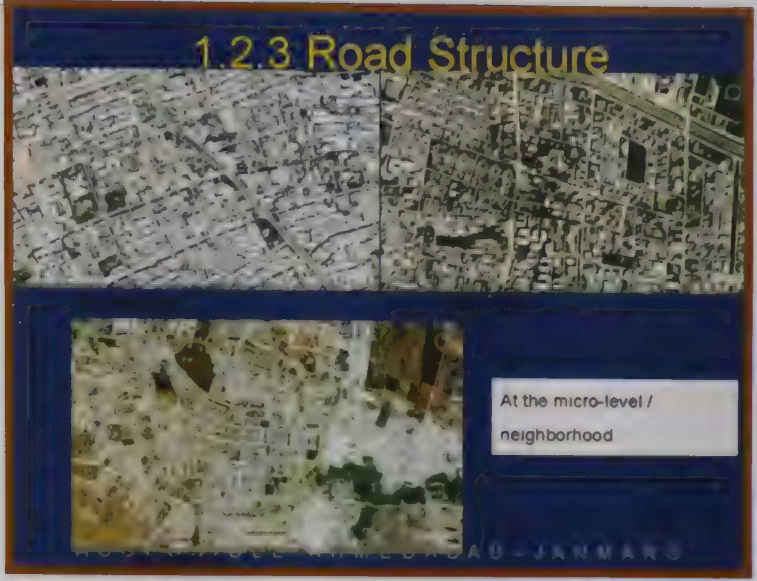
ACCESSIBLE AHMEDABAD – JANMARG



1.2.2Road Structure

At the level of a zone, while the topology seems to tend to a grid

ACCESSIBLE AHMEDABAD-JANMARG



1.2.3 Road Structure

At the micro-level / neighborhood

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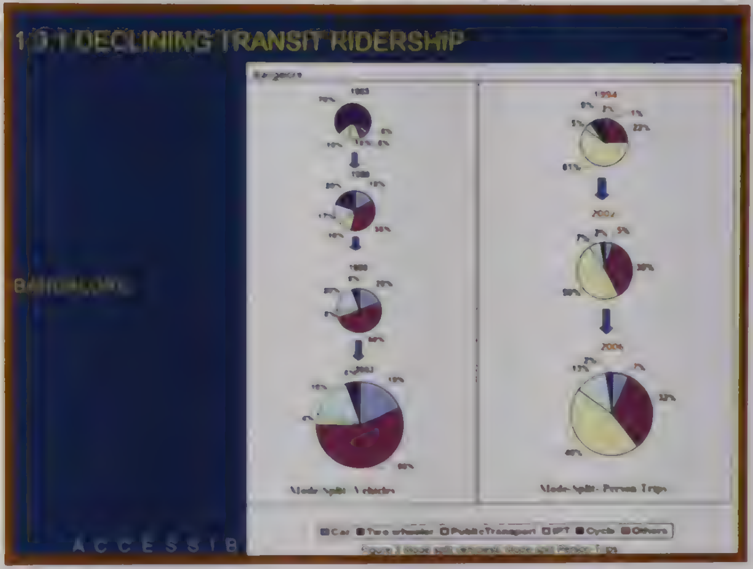
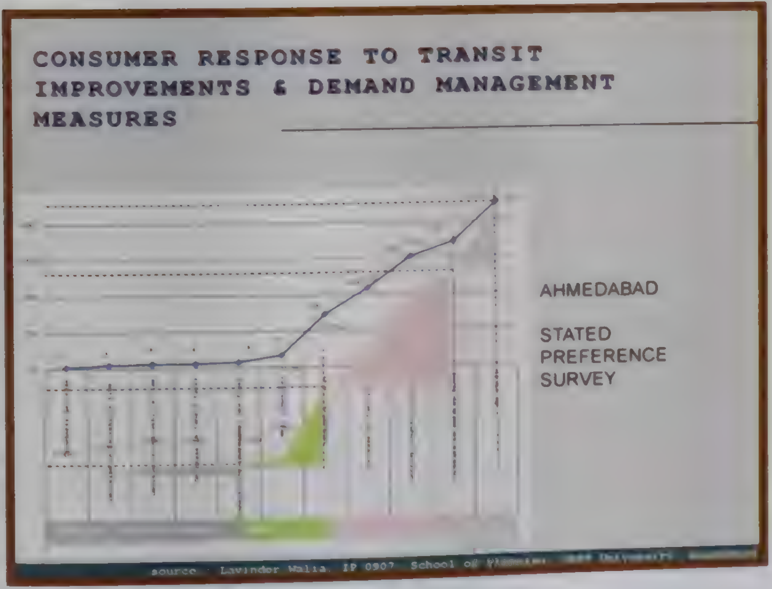


1.3.1 DECLINING TRANSIT RIDERSHIP

ACCESSIB

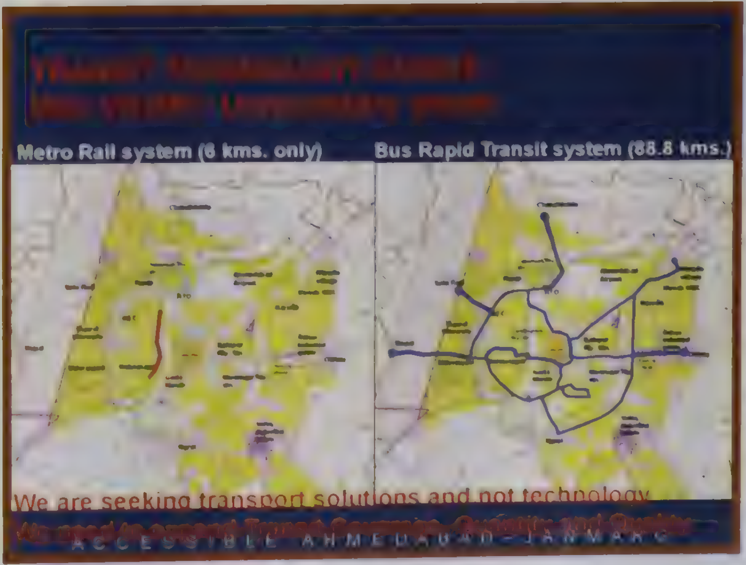


CONSUMER RESPONSE TO TRANSIT IMPROVEMENTS & DEMAND MANAGEMENT MEASURES

AHMEDABAD

STATED PREFERENCE SURVEY

source : Lavinder Walia, IP 0907, School of Planning



[illegible]

Metro Rail system (6 kms. only)

Bus Rapid Transit system (88.8 kms.)

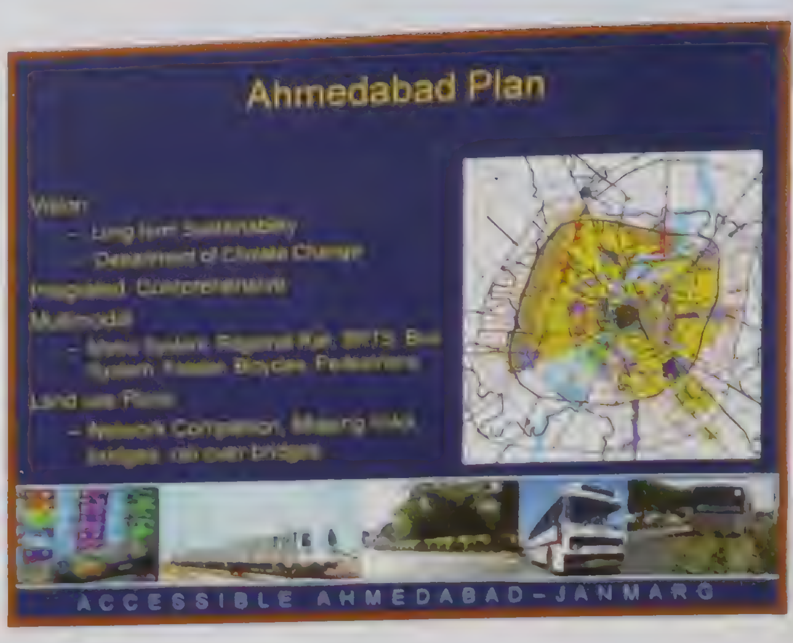
We are seeking transport solutions and not technology

[illegible]

ACCESSIBLE AHMEDABAD-JANMARG

MAKING OF JANMARG A PROGRAMMATIC APPROACH

ACCESSIBLE AHMEDABAD–JANMARG



Ahmedabad Plan

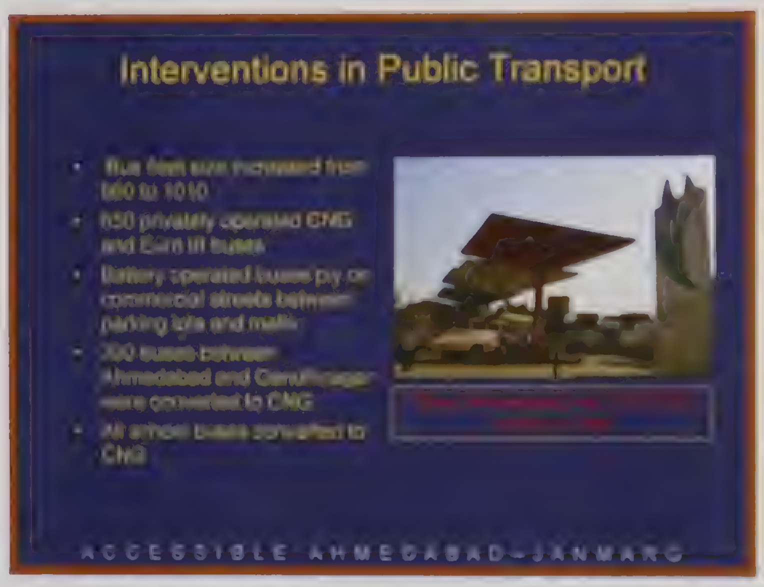
Vision
- Long term Sustainability
- [illegible] of Climate Change

Integrated, Comprehensive

Multimodal
- Metro System, Regional Rail, BRTS, Bus System, Feeder, Bicycles, Pedestrians

Land use Plans
- Network Completion, Missing links, bridges, rail over bridges

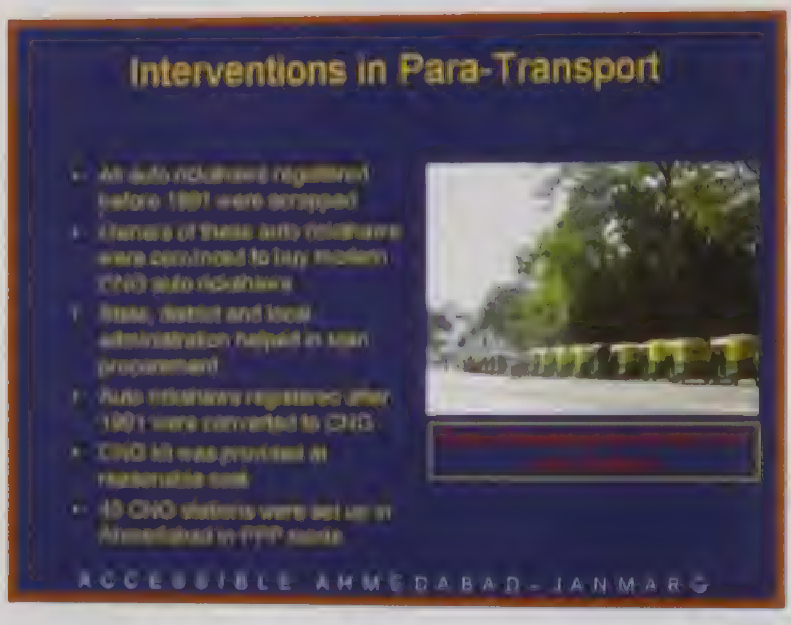
ACCESSIBLE AHMEDABAD–JANMARG



Interventions in Public Transport

- Bus fleet size increased from 560 to 1010
- 650 privately operated CNG and Euro III buses
- Battery operated buses ply on commercial streets between parking lots and malls
- 300 buses between Ahmedabad and Gandhinagar were converted to CNG
- All school buses converted to CNG

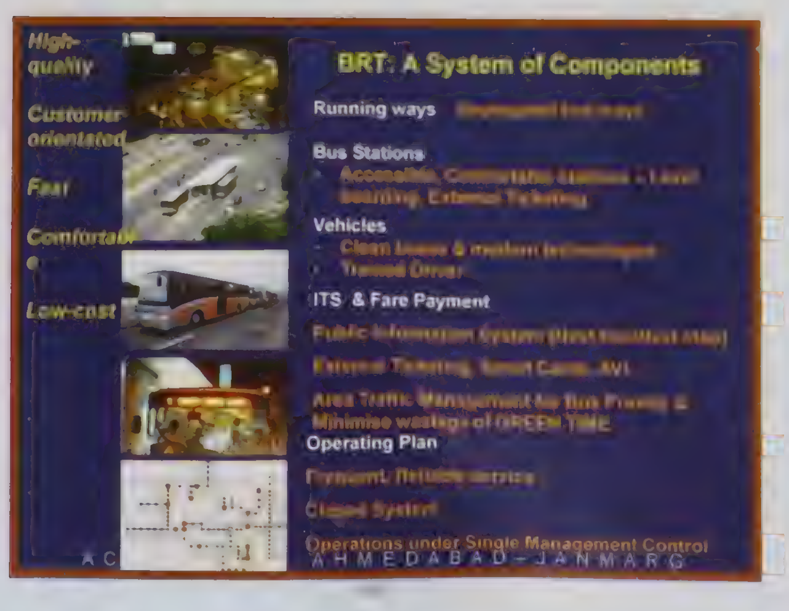
ACCESSIBLE AHMEDABAD–JANMARG



Interventions in Para-Transport

- All auto rickshaws registered before 1991 were scrapped
- Owners of these auto rickshaws were convinced to buy modern CNG auto rickshaws
- State, district and local administration helped in loan procurement
- Auto rickshaws registered after 1991 were converted to CNG
- CNG kit was provided at reasonable cost
- 40 CNG stations were set up in Ahmedabad in PPP mode

ACCESSIBLE AHMEDABAD–JANMARG



High-quality
Customer-orientated
Fast
Comfortable
Low-cost

BRT: A System of Components

Running ways Segregated bus ways

Bus Stations
- Accessible, Comfortable stations – Level boarding, External Ticketing

Vehicles
- Clean buses & modern technologies
- Trained Driver

ITS & Fare Payment

Public Information System [illegible]

External Ticketing, Smart Cards, AVL

Area Traffic Management for Bus Priority & Minimise wastage of GREEN TIME

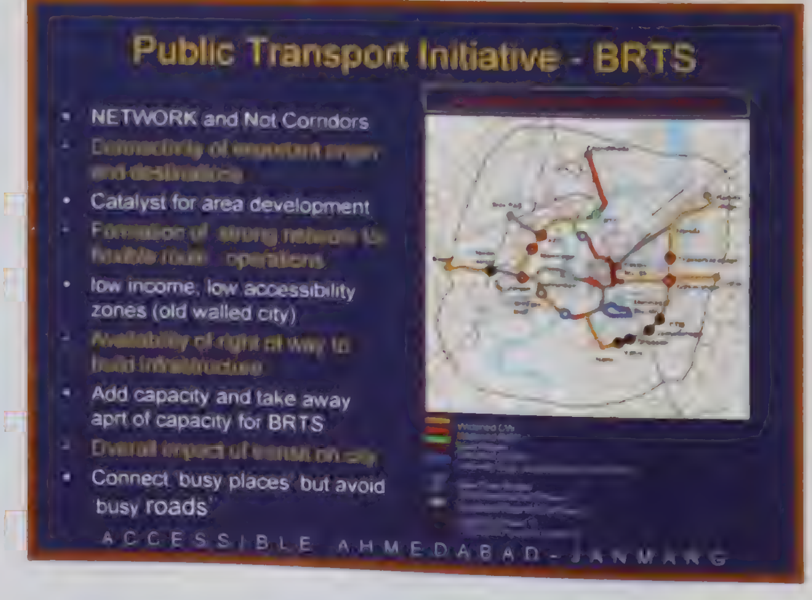
Operating Plan

Frequent, Reliable service

Closed System

Operations under Single Management Control

AC AHMEDABAD–JANMARG



Public Transport Initiative - BRTS

- NETWORK and Not Corridors
- Connectivity of important origin and destinations
- Catalyst for area development
- Formation of strong network to flexible route operations
- low income, low accessibility zones (old walled city)
- Availability of right of way to build infrastructure
- Add capacity and take away aprt of capacity for BRTS
- Overall impact of transit on city
- Connect 'busy places' but avoid 'busy roads'

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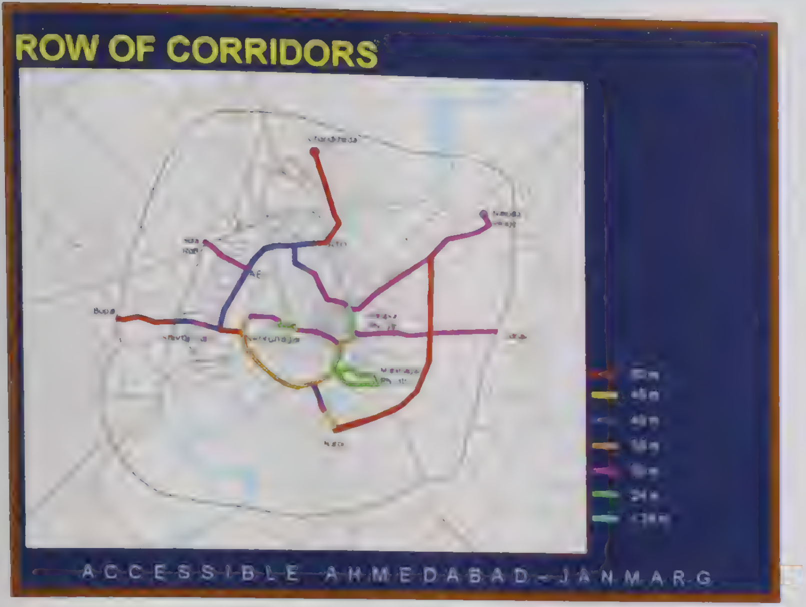

ROW OF CORRIDORS

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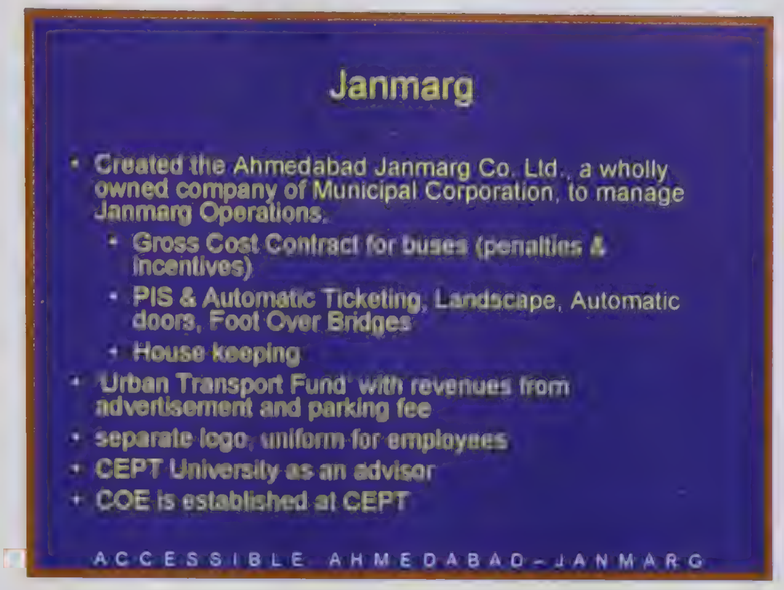
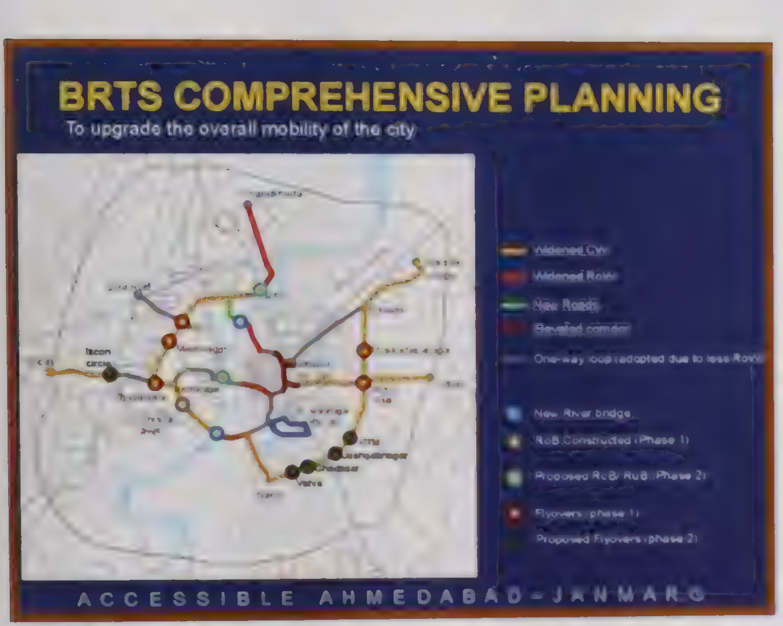


Janmarg

- Created the Ahmedabad Janmarg Co. Ltd., a wholly owned company of Municipal Corporation, to manage Janmarg Operations.
  - Gross Cost Contract for buses (penalties & incentives)
  - PIS & Automatic Ticketing, Landscape, Automatic doors, Foot Over Bridges
  - House keeping
- 'Urban Transport Fund' with revenues from advertisement and parking fee
- separate logo, uniform for employees
- CEPT University as an advisor
- COE is established at CEPT

ACCESSIBLE AHMEDABAD – JANMARG

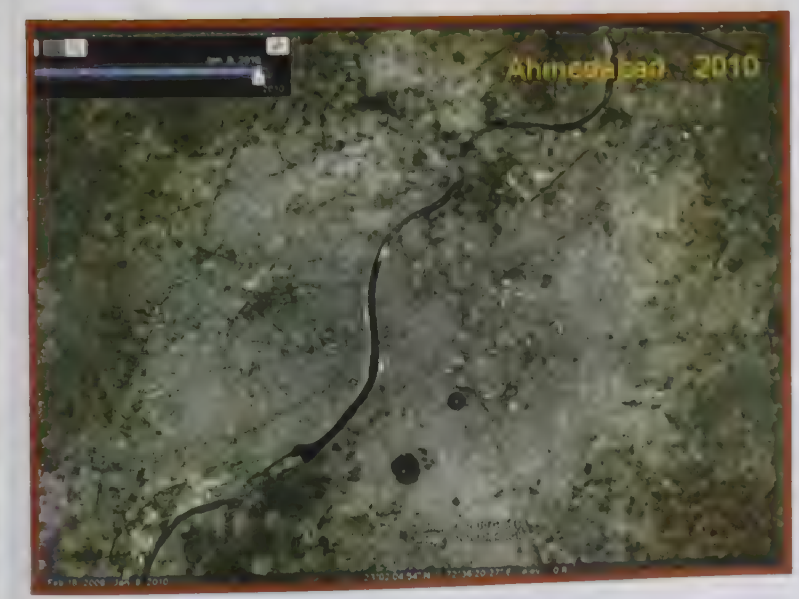


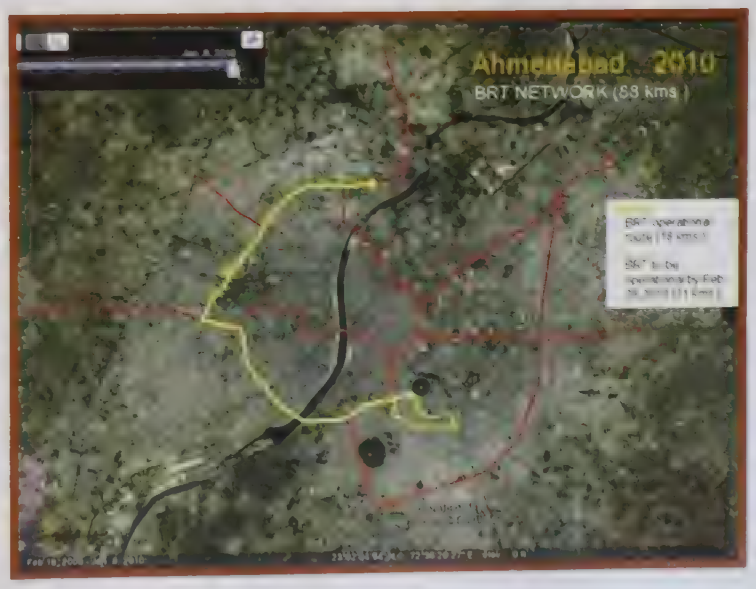
BRTS COMPREHENSIVE PLANNING

To upgrade the overall mobility of the city

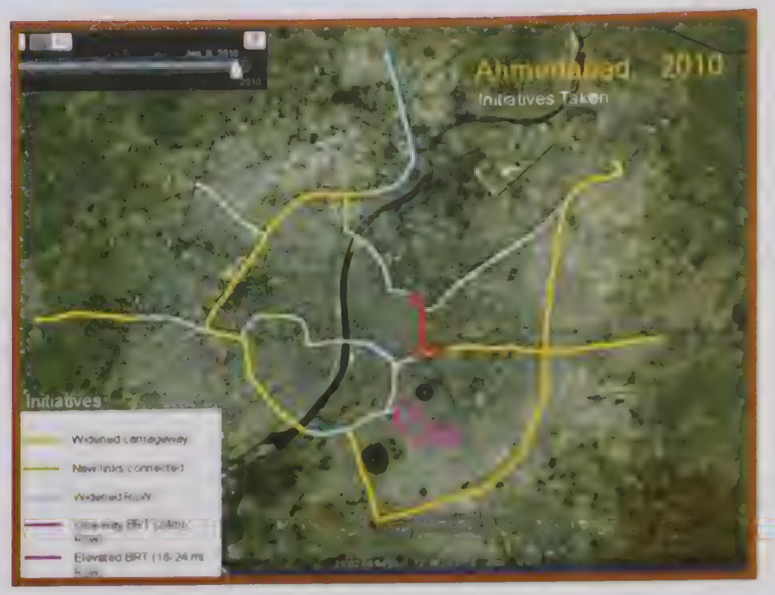
Widened C/W
Widened RoW
New Roads
Elevated corridor
One-way loop (adopted due to less RoW)
New River bridge
RoB Constructed (Phase 1)
Proposed RoB/ RuB (Phase 2)
Flyovers (phase 1)
Proposed Flyovers (phase 2)

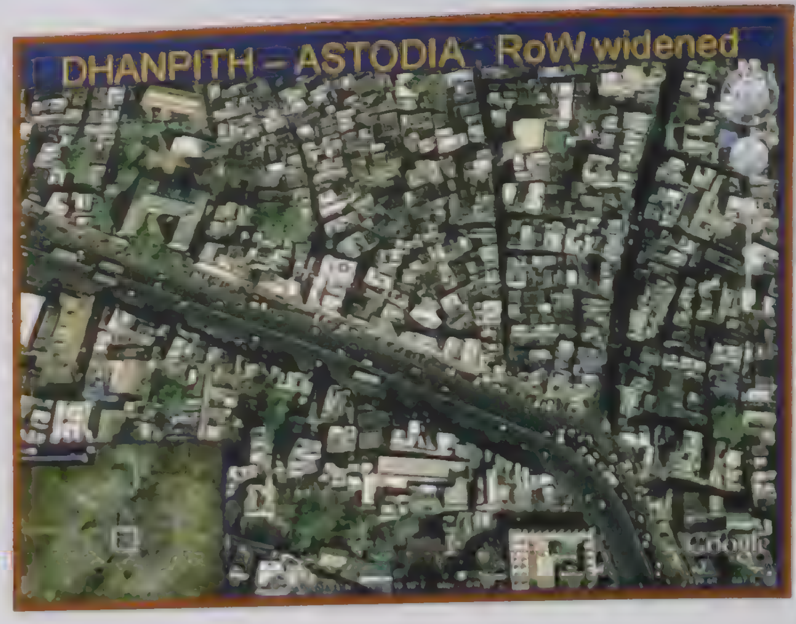
ACCESSIBLE AHMEDABAD – JANMARG



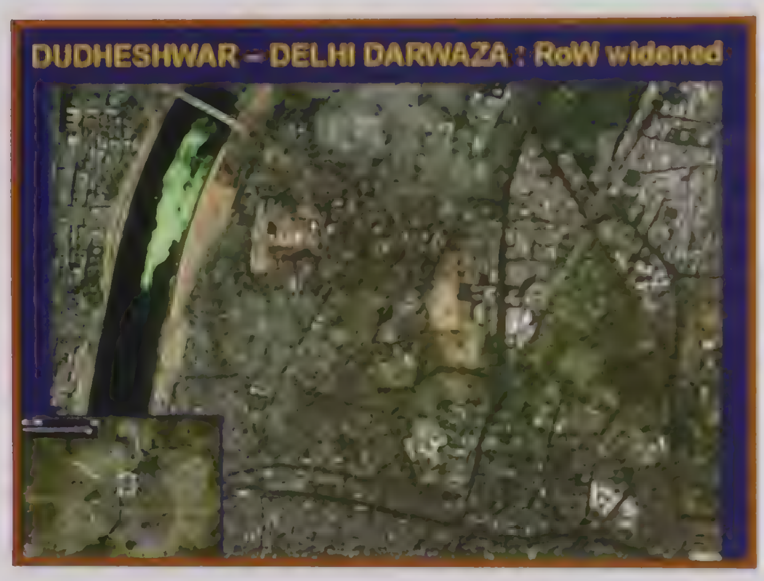


Ahmedabad 2010
BRT NETWORK (88 kms)
BRT operational route (18 kms)
BRT to be operational by Feb 28, 2010 (21 Kms)

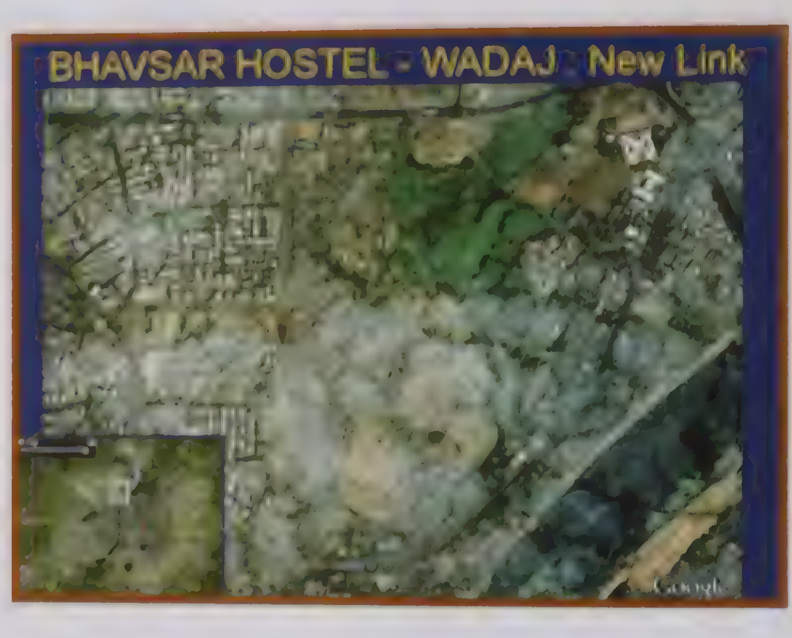




DHANPITH – ASTODIA : RoW widened

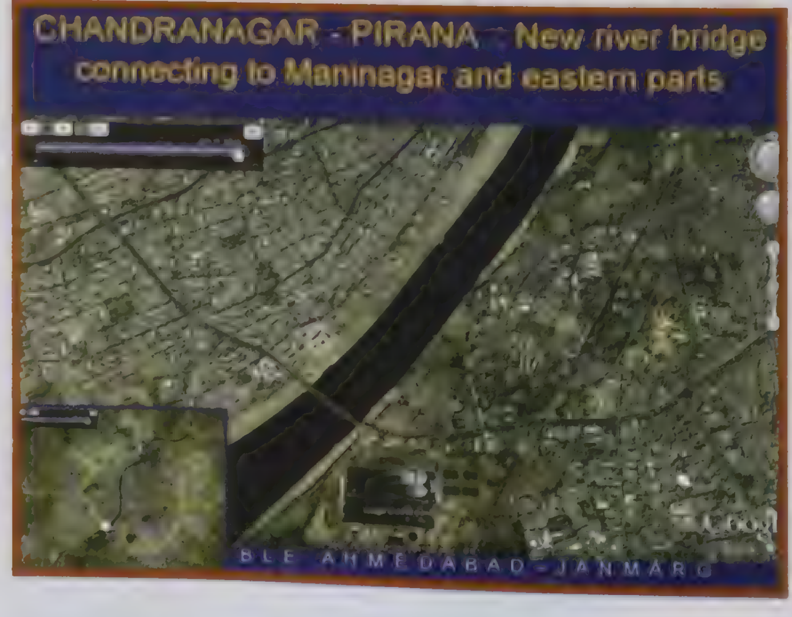


DUDHESHWAR – DELHI DARWAZA : RoW widened

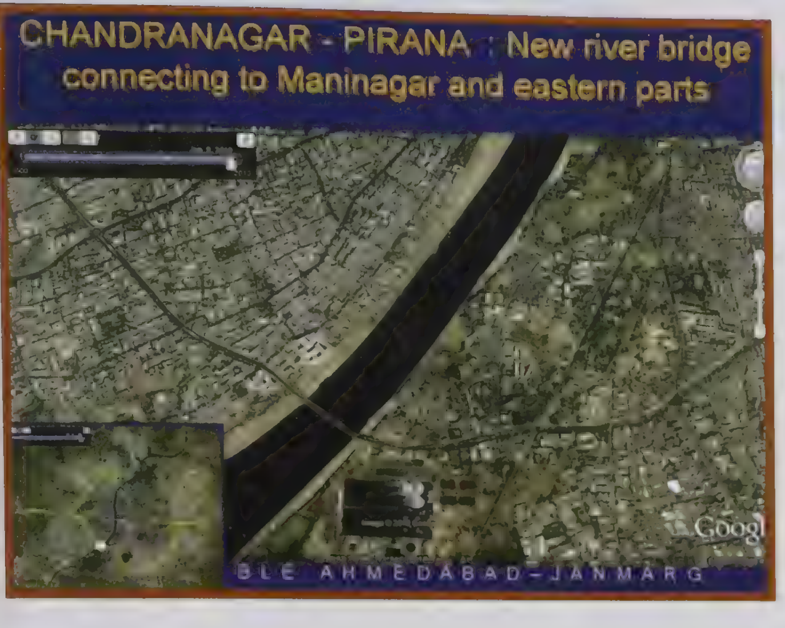


BHAVSAR HOSTEL - WADAJ : New Link

GULBAI TEKRA : New Link

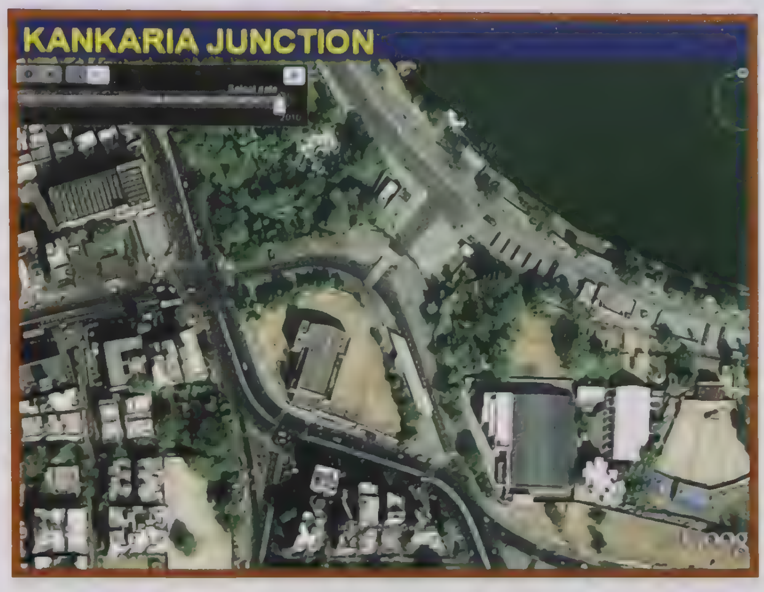


CHANDRANAGAR - PIRANA : New river bridge connecting to Maninagar and eastern parts

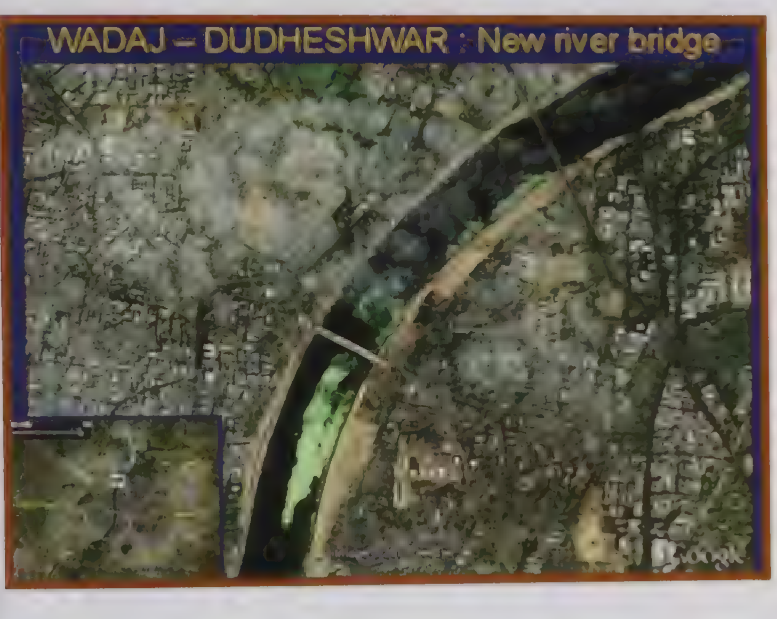


CHANDRANAGAR - PIRANA : New river bridge connecting to Maninagar and eastern parts

BLE AHMEDABAD–JANMARG



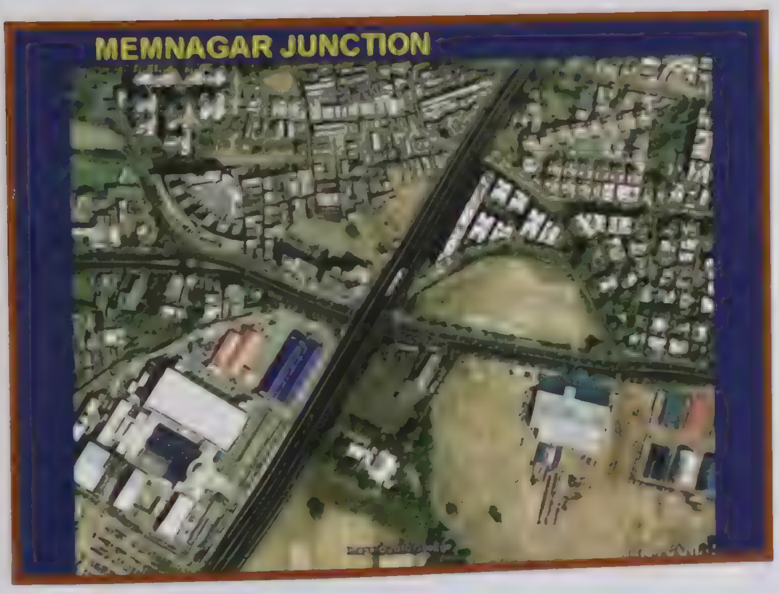
KANKARIA JUNCTION



WADAJ – DUDHESHWAR : New river bridge

KANKARIA LAKEFRONT DEVELOPMENT

ACCESSIBLE AHMEDABAD–JANMARG



MEMNAGAR JUNCTION

SHREYAS RLY. CROSSING : R.O.B.

SHREYAS RLY. CROSSING : R.O.B.

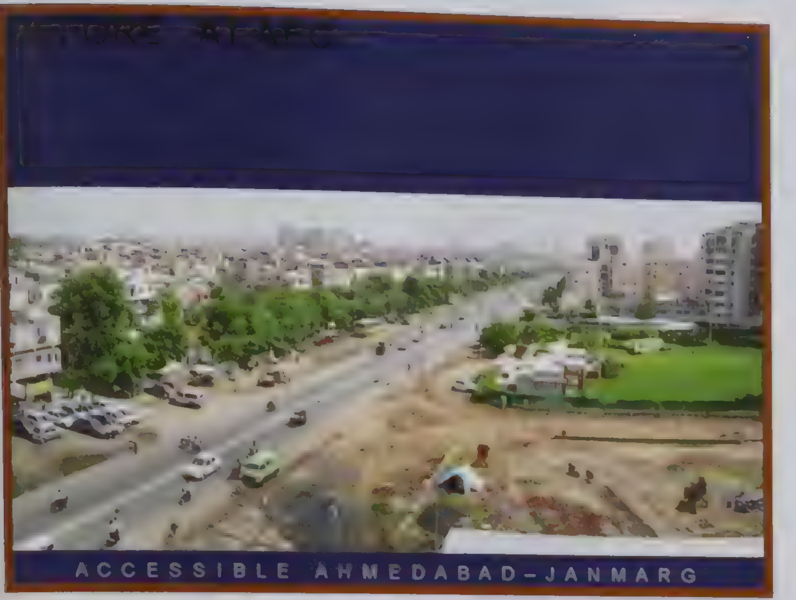
SHIVRANJANI – Split Flyovers

Accessing Kalupur Railway Station : Elevated BRT

Accessing Maninagar Railway Station and Kankaria One - way BRT

BEFORE..AT AKHBARNAGAR

AFTER.. BRT AT AKHBARNAGAR



BEFORE – AT AEC

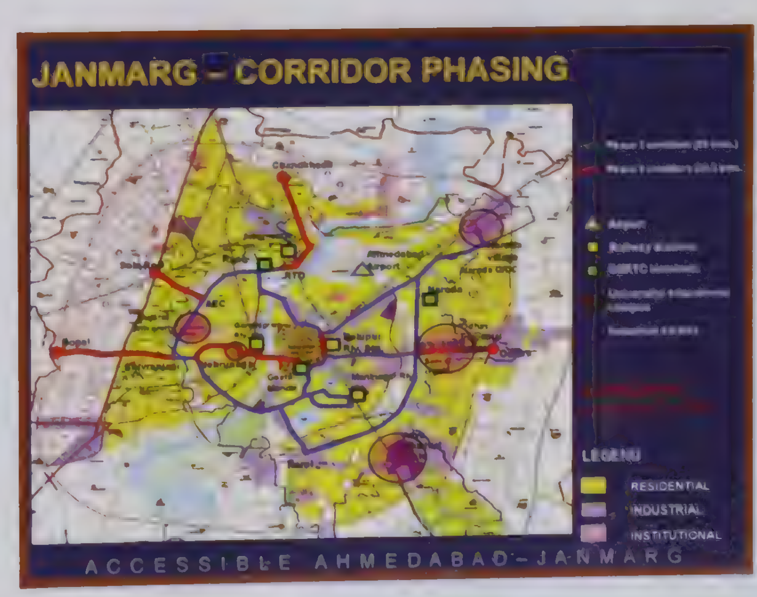
ACCESSIBLE AHMEDABAD–JANMARG

AFTER..BRT AT AEC AND SPLIT FLYOVER

[illegible]

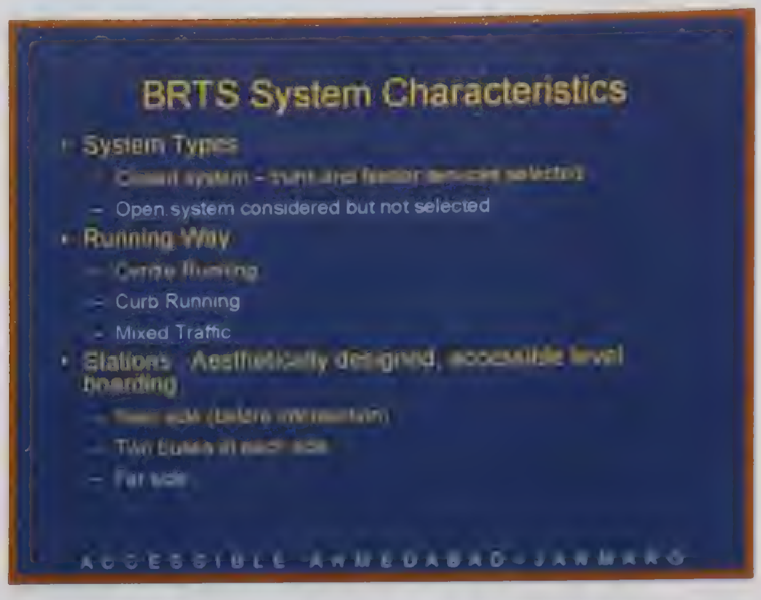
AFTER – AT [illegible]

ANJALI JUNCTION



JANMARG – CORRIDOR PHASING

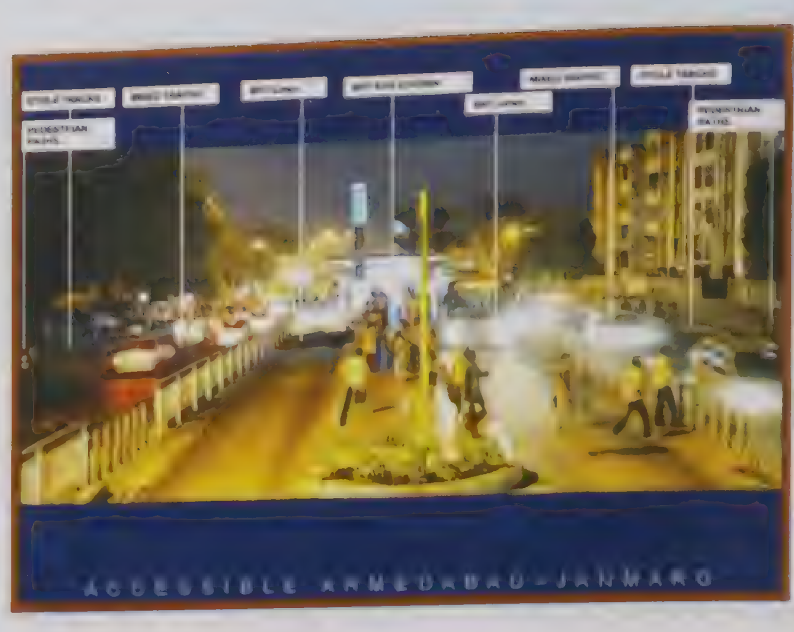
ACCESSIBLE AHMEDABAD–JANMARG



BRTS System Characteristics

- System Types
  - Closed system – trunk and feeder services selected
  - Open system considered but not selected
- Running Way
  - Centre Running
  - Curb Running
  - Mixed Traffic
- Stations: Aesthetically designed, accessible level boarding
  - Near side (before intersection)
  - Two buses in each side
  - Far side

ACCESSIBLE AHMEDABAD – JANMARG



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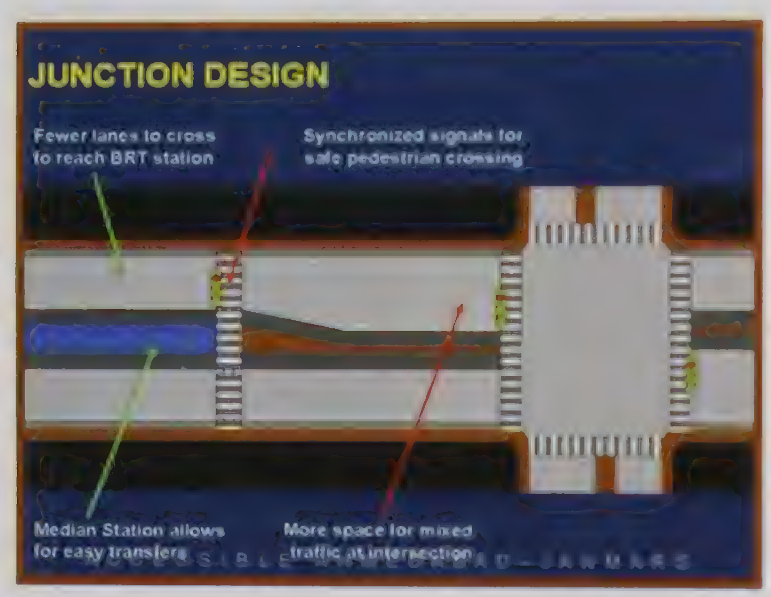


JUNCTION DESIGN

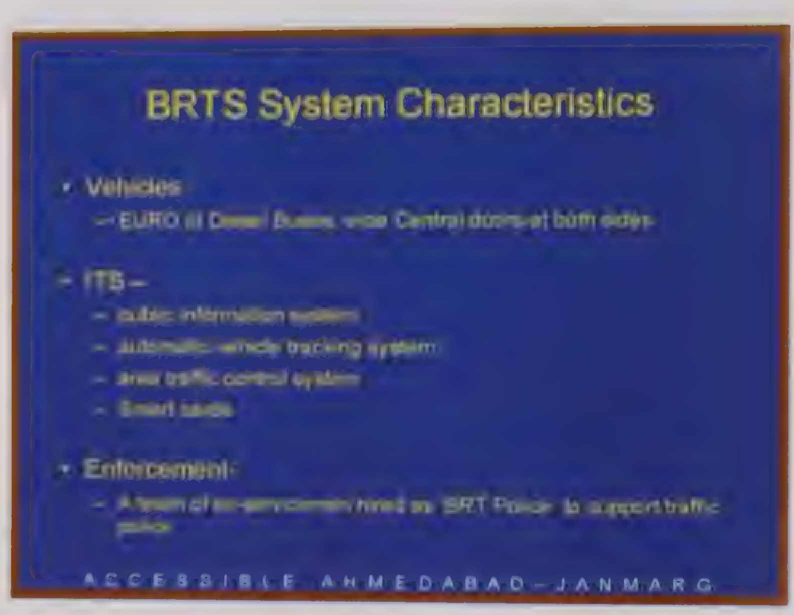
Fewer lanes to cross to reach BRT station

Synchronized signals for safe pedestrian crossing

Median Station allows for easy transfers

More space for mixed traffic at intersection

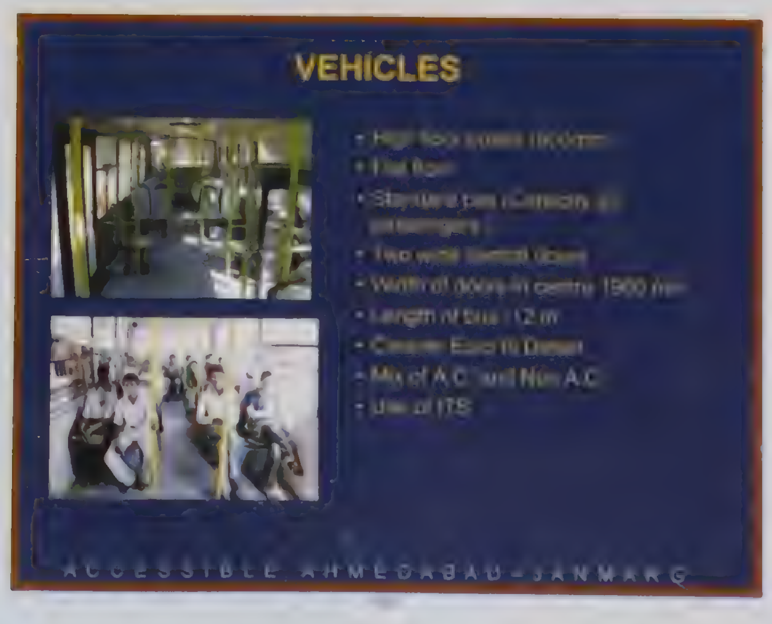
ACCESSIBLE AHMEDABAD – JANMARG



BRTS System Characteristics

- Vehicles
  - EURO III Diesel Buses, wide Central doors at both sides
- ITS –
  - public information system
  - automatic vehicle tracking system
  - area traffic control system
  - Smart cards
- Enforcement
  - A team of ex-servicemen hired as 'BRT Police' to support traffic police

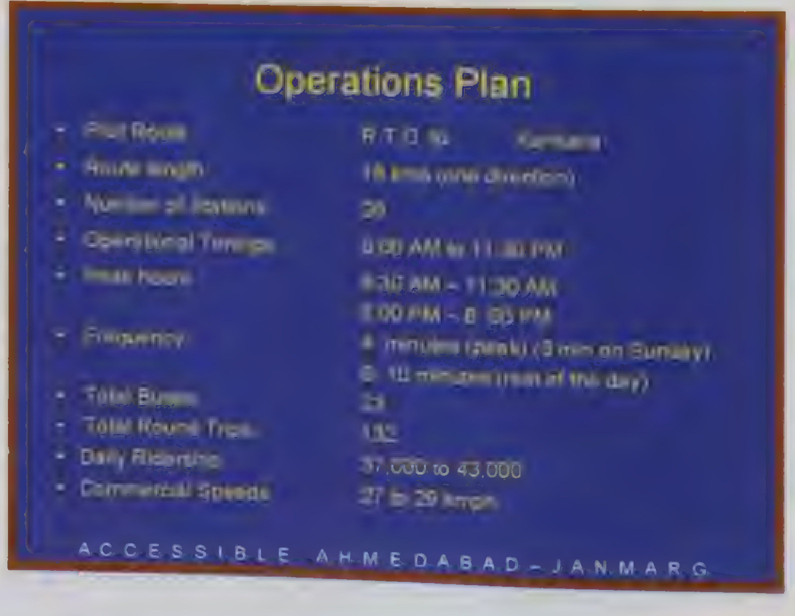
ACCESSIBLE AHMEDABAD – JANMARG



VEHICLES

- High floor buses (900mm)
- Flat floor
- Standard bus (Capacity [illegible] passengers)
- Two wide central doors
- Width of doors in centre [illegible] mm
- Length of bus : 12 m
- Cleaner Euro III Diesel
- Mix of A.C. and Non A.C.
- Use of ITS

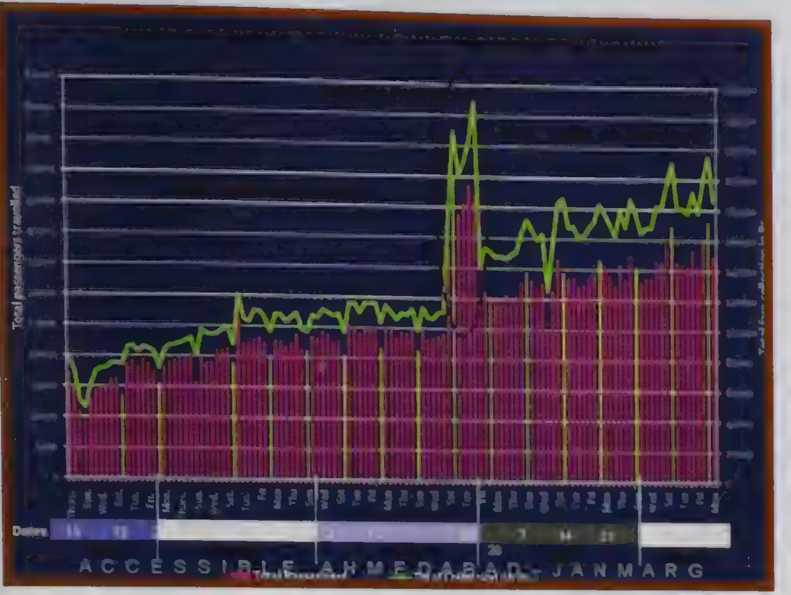
ACCESSIBLE AHMEDABAD – JANMARG



Operations Plan

Pilot Route	R.T.O. to [illegible]
Route length	[illegible] kms (one direction)
Number of stations	20
Operational Timings	[illegible] AM to 11.[illegible] PM
Peak hours	8:30 AM – 11:30 AM 5:00 PM – 8:00 PM
Frequency	4 minutes (peak) (3 min on Sunday) 6–10 minutes (rest of the day)
Total Buses	[illegible]
Total Round Trips	[illegible]
Daily Ridership	37,000 to 43,000
Commercial Speeds	27 to 29 kmph

ACCESSIBLE AHMEDABAD – JANMARG



ACCESSIBLE AHMEDABAD - JANMARG

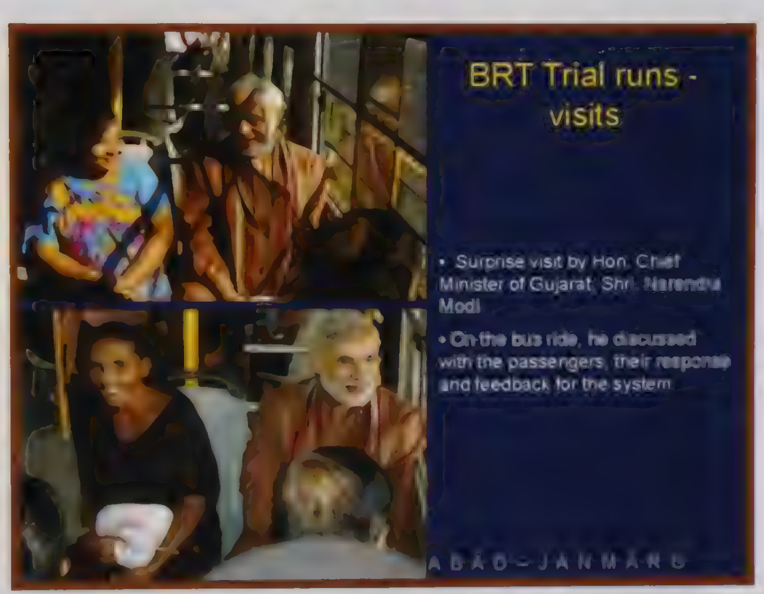
Comparative Indicators

	1st Month (15 Oct– 14Nov '09)	2nd Month (15 Nov – 15 Dec '09)	3rd Month (16 dec '09 – 15 Jan '10)	4th Month (16 Jan '10 – 15 feb '10)
Route	R.T.O.- Chandranagar	R.T.O.- Chandranagar	R.T.O.-Kankaria	R.T.O.-Kankaria
Operation Timings	7:00 AM-10:30 PM	7:00 AM-10:30 PM	6:00 AM-11:30 PM	6:00 AM-11:30 PM
Total Expenditures / day as Rs 34 / km	Rs 123760 / day	Rs 123760 / day	Rs176970 / day	Rs176970 / day
Total buses operate/day	18	18	18 23	23-25
Avg. Total Kms/day	3640 km	3640 km	5205 km	5205 km
Avg. Total Kms/bus /day	207 km	207 km	226 km	226 km
Total Passengers	536749	715653(33.3%)	971138 (80 9%)	1105814 (106%)
Total fare collection	Rs 2511888	Rs 3333705 (32 7%)	Rs 4649050 (85 1%)	Rs 5545853 (121%)
Avg. pax/day	17315	23086 (33.3%)	31327 (80.9%)	35672 (106%)
Avg. collection/day	Rs 81029	Rs 107539 (32.7%)	Rs149969 (85 1%)	Rs 178898 5 (121%)
Avg pax./bus/day	962	1283 (33%)	1528 (58.9%)	1740 (80.9%)
Avg. collection /bus/day	Rs 4502	Rs 5974 (32 7%)	Rs7315 (62 5%)	Rs 8726 (93 9%)

Visit to BRT by Religious leaders of all sects

Visit to BRT by eminent Industrialists of Ahmedabad

Visit to BRT by eminent Doctors of Ahmedabad



BRT Trial runs - visits

- Surprise visit by Hon. Chief Minister of Gujarat, Shri. Narendra Modi
- On the bus ride, he discussed with the passengers, their response and feedback for the system

ABAD – JANMARG

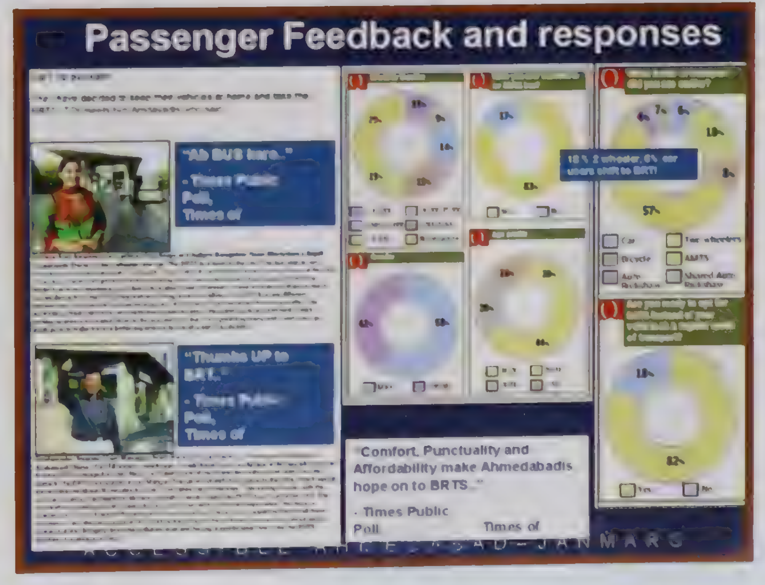
Vibrant BRTS

The BRTS, which sees 16,000 passengers during normal days, ferried 33,000 Amdavadis during Navratri

– Narayan Kothari, resident of Vasna

ACCESSIBLE AHMEDABAD - JANMARG

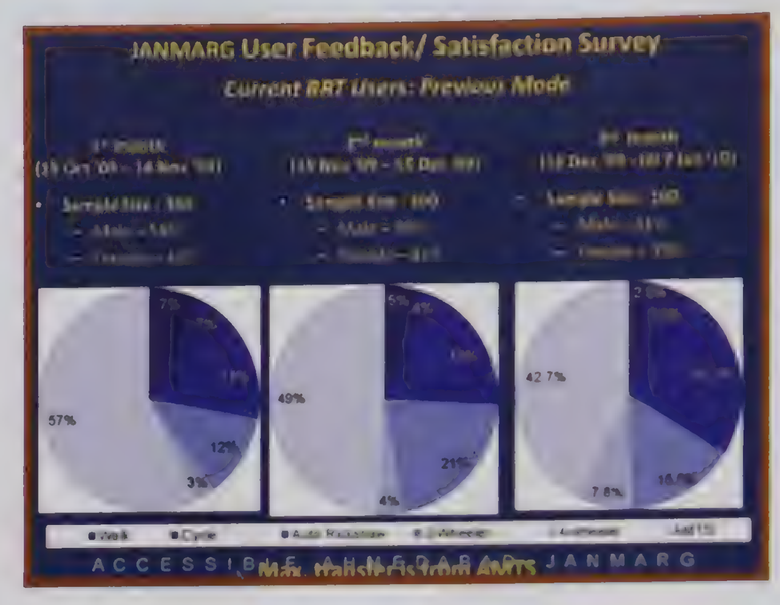
Passenger Feedback and responses


"Ab BUS karo..."
- Times Public Poll, Times of
"Thumbs UP to BRT."
- Times Public Poll, Times of
18 % 2 wheeler, 6% car users shift to BRT!
57%
82%
Car
Bicycle
Auto Rickshaw
Two wheelers
AMTS
Shared Auto Rickshaw
Yes
No

"Comfort, Punctuality and Affordability make Ahmedabadis hope on to BRTS..."

- Times Public Poll, Times of

ACCESSIBLE AHMEDABAD - JANMARG

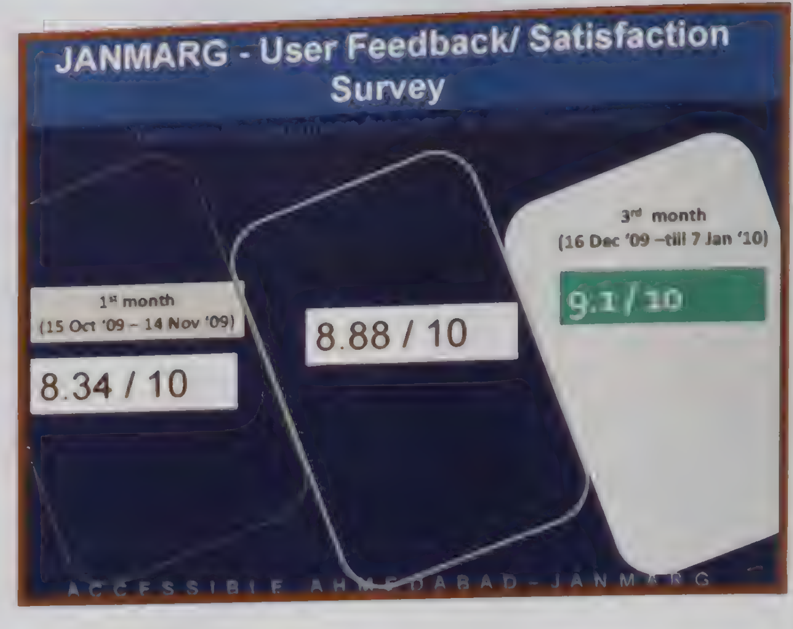


JANMARG User Feedback/ Satisfaction Survey

Current BRT Users: Previous Mode

Max. transfers from AMTS

ACCESSIBLE AHMEDABAD - JANMARG



JANMARG - User Feedback/ Satisfaction Survey

1st month (15 Oct '09 – 14 Nov '09)

8.34 / 10

8.88 / 10

3rd month (16 Dec '09 –till 7 Jan '10)

9.1 / 10

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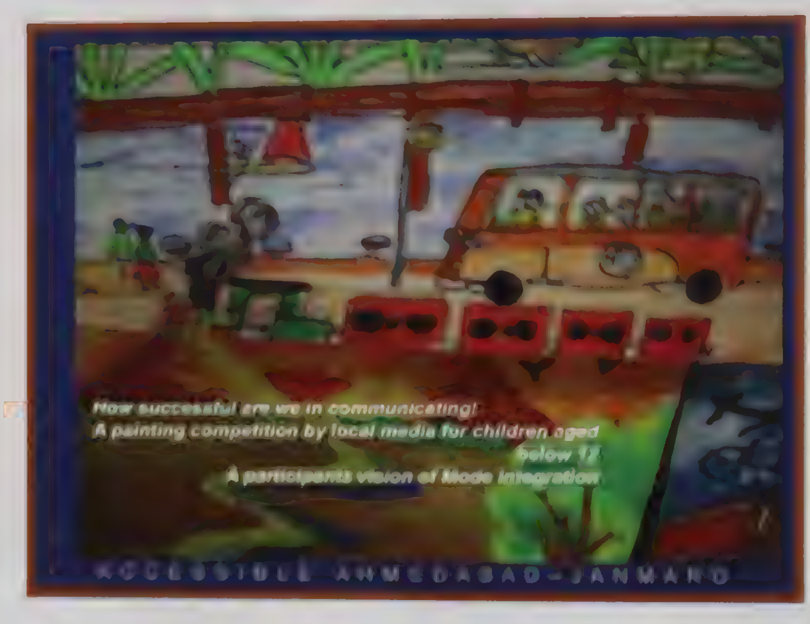


How successful are we in communicating!

A painting competition by local media for children aged below 12

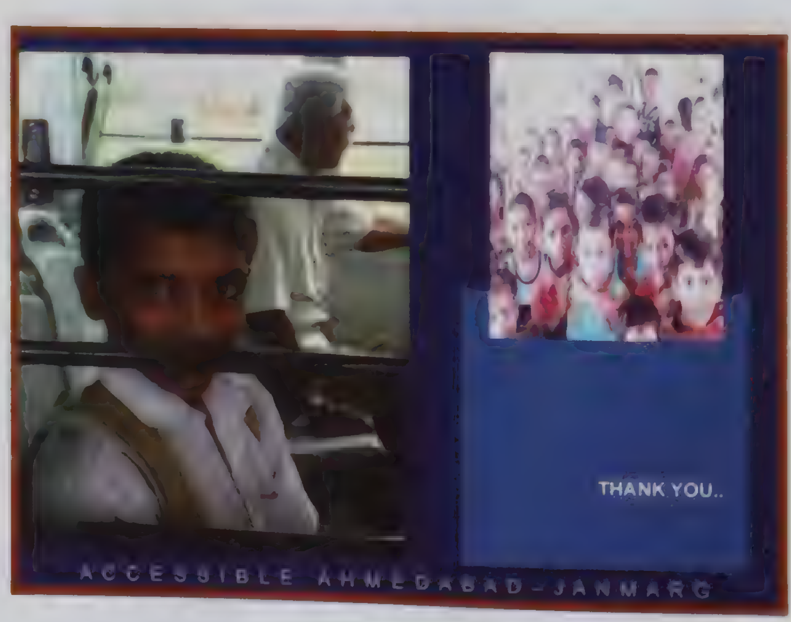
A participants vision of Mode integration

ACCESSIBLE AHMEDABAD - JANMARG

How successful are we in communicating!

A painting competition by local media for children aged below 12

A participants vision of TOD



THANK YOU..

ACCESSIBLE AHMEDABAD - JANMARG

Question and Answer:

Q. Would pilot BRT projects be successful in the context of other BRT systems in India like Delhi, Pune?

Ans. In short YES. But it depends on the features of the corridor like the length of the corridor, and how it is integrated with the existing mass transit and other accessibility facilities etc. The BRT systems in Delhi and Pune are operating for a smaller length, so that is one of the reasons why the benefits are unseen / perceived by the people. Especially BRT in Delhi do have some conceptual drawbacks which should be corrected to be called a full BRT system.

Q. What are the PPHPD along the BRT corridors of Ahmedabad?

Ans. 3500-5000

Q. If BRT could cater for more than 10,000 PPHPD, why Metro is under consideration for Ahmedabad city?

Ans. Ahmedabad is a seventh largest city in India with 6 million populations. There is a proposal for metro (network of 44 km). Infrastructure projects not only solve the intended purposes and also add value, urbane charm to a city. For example Delhi Metro is not only commuting the people and also the nations' pride globally.

Q. What is the Ahmadabad BRT Peak Hour Ridership and the frequency?

Ans. Peak Hour Ridership-100 people/ bus and It's about 2000 PPHPD. After the network expansion Max PPHPD would reach 5000

Q. What will be the max PPHPD if you increase the frequency?

Ans. Professor said at present its 3 mins frequency with single bus. He explained that if they run double bus then PPHPD gets double and reach about 4000. If they implement longer and double buses together then the PPHPD would reach 8000. If they have an overtaking lane then PPHPD can even more increase.

Q. Any Economic Rate of Return (ERR) calculation done prior to BRTS implementation?

Ans. Speaker replied that ERR calculation was done prior to BRTS implementation. ERR was found to be 49%.

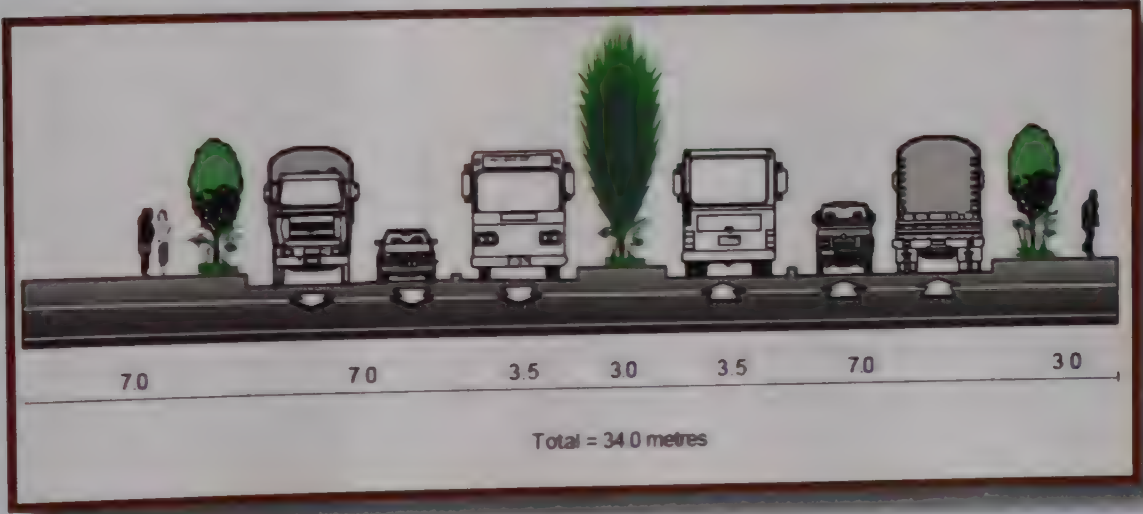
Q. The Fare Structure for the BRT and the normal bus is same? (Smt. Niyati Tandon, ICRA Consultants)

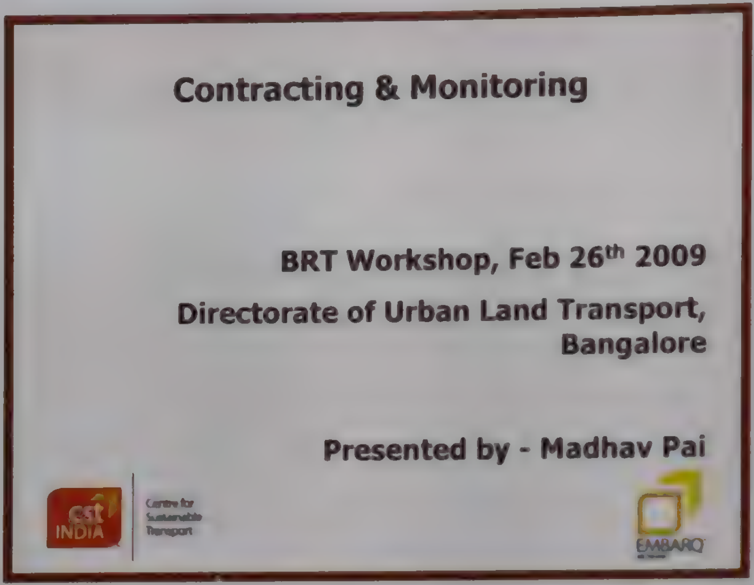
Ans. Speaker replied that fare structure for the BRT is 1.5 times more than the normal bus, but he clearly explained that practically it's 1.15 times as that of a normal bus. The starting fare for the normal bus is 1 rupee and per km it's incremental by 55 paisa. Starting fare of BRT is about 2 rupees for 3 stations which is about 1 .5 kms. Up to 9 stations BRT fare is about 5 Rupees.

Session 4: Contracting and Tendering

Mr. Madhav Pai presented the ethics of contacting and tendering. He highlighted the key points for success of BRT projects with the examples of Seoul, London and Sao Paulo like strong leadership in the decision making process, bus priority and segregation, creating an environment for equal sharing of risks and incentive between system planner and operator, financial analysis, system performance monitoring and user feedback.

He insisted to conduct the performance monitoring of BRTS by presenting case study of Indore city where such study brought significant improvements.





Contracting & Monitoring

BRT Workshop, Feb 26th 2009

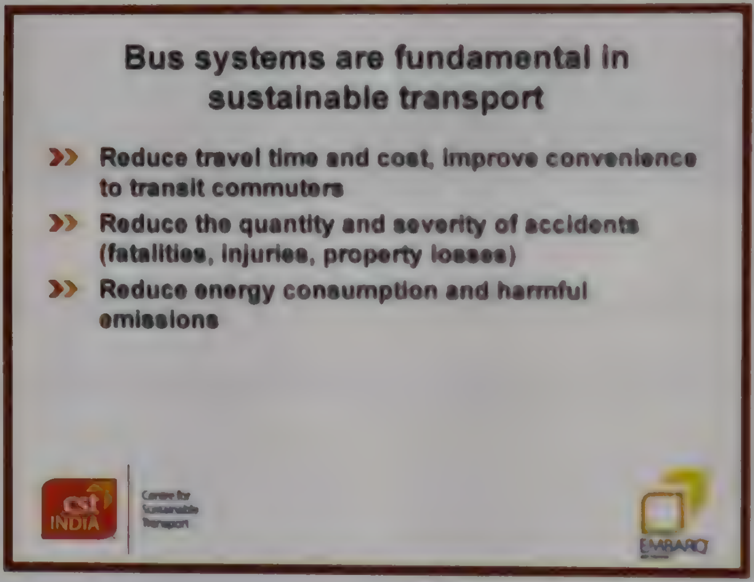
Directorate of Urban Land Transport,
Bangalore

Presented by - Madhav Pai

Sustainable Urban Transport

- Pedestrian and Bicycles
- Public Transportation
- Transit Oriented Development
- Disincentives to Car Use

Bicycle Tracks and Pedestrian Facilities – Delhi BRT Corridor



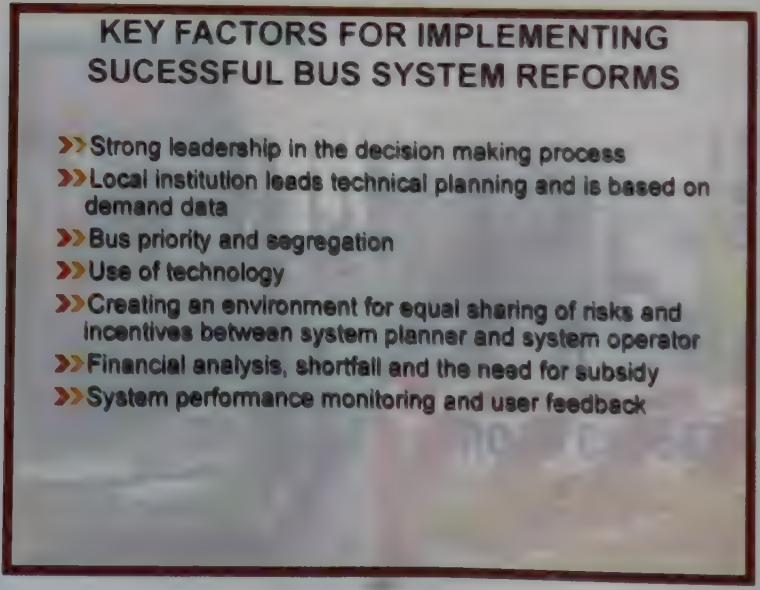
Bus systems are fundamental in sustainable transport

- Reduce travel time and cost, improve convenience to transit commuters
- Reduce the quantity and severity of accidents (fatalities, injuries, property losses)
- Reduce energy consumption and harmful emissions

CITY-WIDE BUS REFORMS

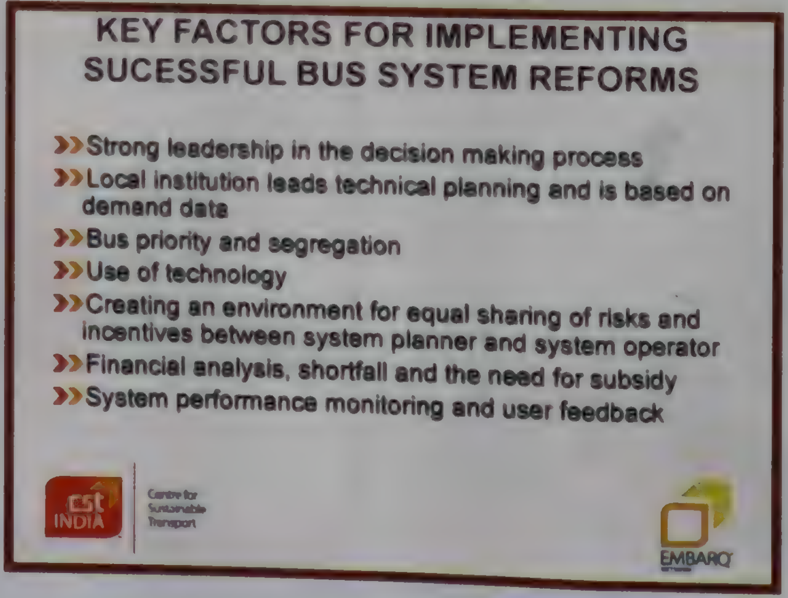
KEY FACTORS FOR IMPLEMENTING SUCESSFUL BUS SYSTEM REFORMS LONDON, SAO PAULO & SEOUL

EMBARQ, 2009



KEY FACTORS FOR IMPLEMENTING SUCESSFUL BUS SYSTEM REFORMS

- Strong leadership in the decision making process
- Local institution leads technical planning and is based on demand data
- Bus priority and segregation
- Use of technology
- Creating an environment for equal sharing of risks and incentives between system planner and system operator
- Financial analysis, shortfall and the need for subsidy
- System performance monitoring and user feedback



KEY FACTORS FOR IMPLEMENTING SUCESSFUL BUS SYSTEM REFORMS

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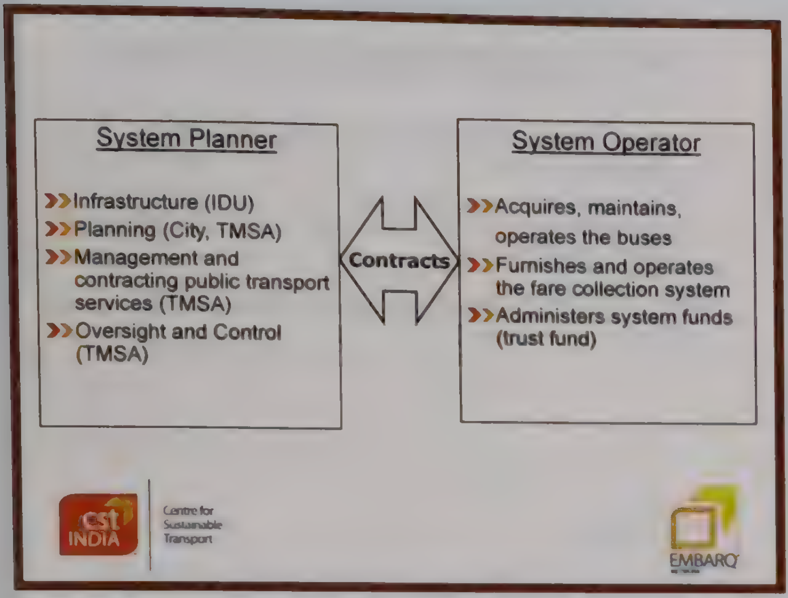


System Planner

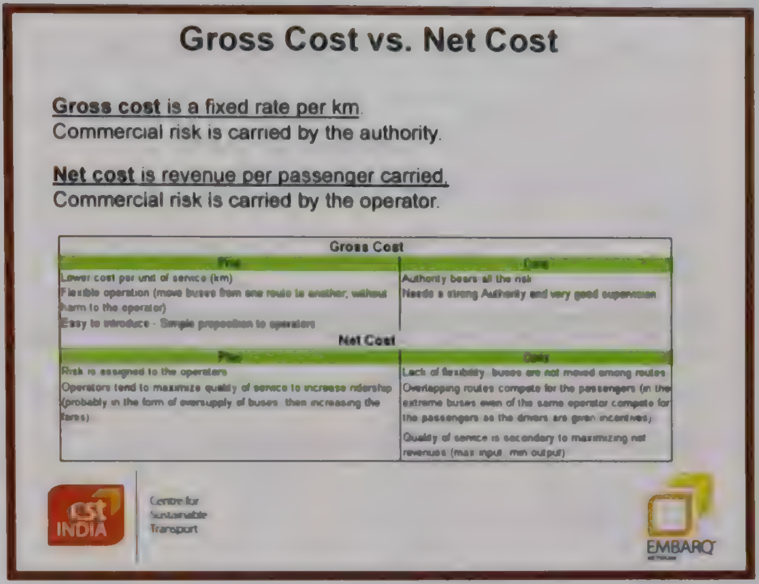
- Infrastructure (IDU)
- Planning (City, TMSA)
- Management and contracting public transport services (TMSA)
- Oversight and Control (TMSA)

Contracts

System Operator

- Acquires, maintains, operates the buses
- Furnishes and operates the fare collection system
- Administers system funds (trust fund)

Centre for Sustainable Transport



Gross Cost vs. Net Cost

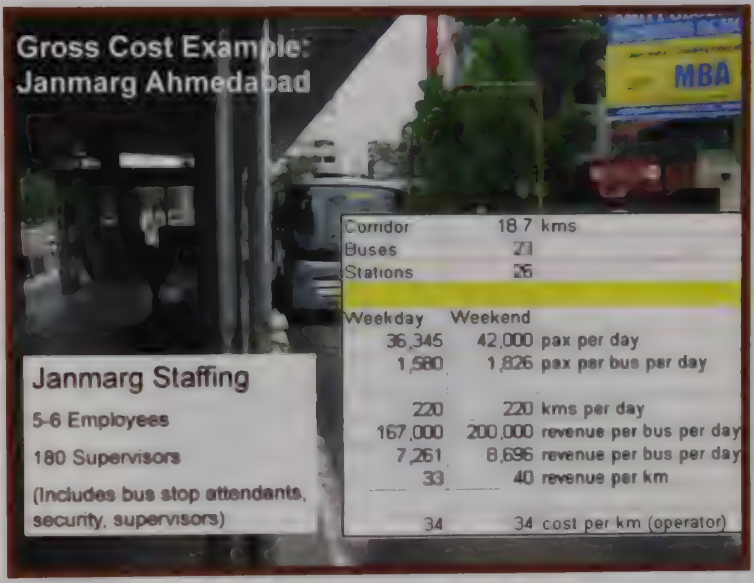
Gross cost is a fixed rate per km.
Commercial risk is carried by the authority.

Net cost is revenue per passenger carried.
Commercial risk is carried by the operator.

Gross Cost	
Pros	Cons
Lower cost per unit of service (km) Flexible operation (move buses from one route to another, without harm to the operator) Easy to introduce - Simple proposition to operators	Authority bears all the risk Needs a strong Authority and very good supervision
Net Cost	
Pros	Cons
Risk is assigned to the operators Operators tend to maximize quality of service to increase ridership (probably in the form of oversupply of buses then increasing the fares)	Lack of flexibility buses are not moved among routes Overlapping routes compete for the passengers (in the extreme buses even of the same operator compete for the passengers as the drivers are given incentives) Quality of service is secondary to maximizing net revenues (max input min output)

Centre for Sustainable Transport

Gross Cost – Janmarg Ahmedabad



Gross Cost Example: Janmarg Ahmedabad

Janmarg Staffing

5-6 Employees

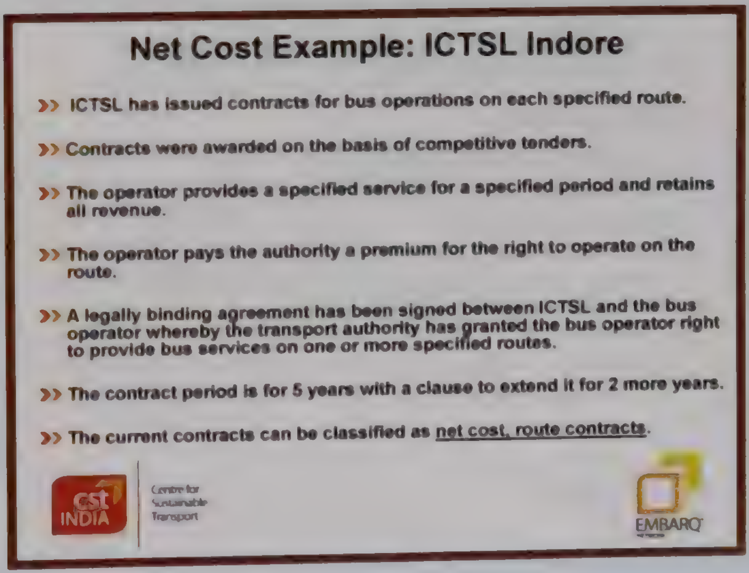
180 Supervisors

(Includes bus stop attendants, security, supervisors)

Corridor 18.7 kms
Buses 23
Stations 26

Weekday	Weekend	
36,345	42,000	pax per day
1,580	1,826	pax per bus per day
220	220	kms per day
167,000	200,000	revenue per bus per day
7,261	8,696	revenue per bus per day
33	40	revenue per km
34	34	cost per km (operator)

Net Cost Example: ICTSL Indore



Net Cost Example: ICTSL Indore

- ICTSL has issued contracts for bus operations on each specified route.
- Contracts were awarded on the basis of competitive tenders.
- The operator provides a specified service for a specified period and retains all revenue.
- The operator pays the authority a premium for the right to operate on the route.
- A legally binding agreement has been signed between ICTSL and the bus operator whereby the transport authority has granted the bus operator right to provide bus services on one or more specified routes.
- The contract period is for 5 years with a clause to extend it for 2 more years.
- The current contracts can be classified as net cost, route contracts.

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Net Cost Example: ICTSL Indore

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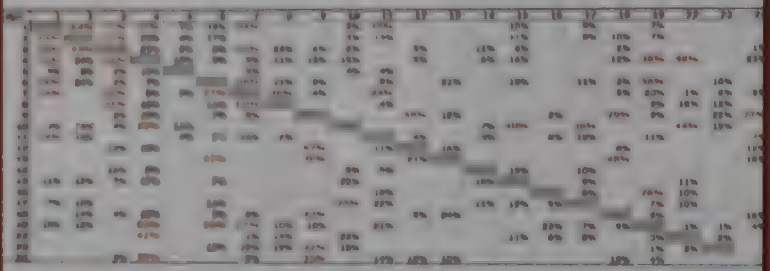
Net Cost Example: ICTSL Indore

- There is on-street competition for passengers on overlapping routes.
- Operators have a tendency to miss first and last trips and requires close monitoring
- The authority's abilities to make essential changes to the network are restricted.

Matrix for Overlapping Routes (%)



Mixed Approaches

TransMilenio, Bogota:

1. Initial bid to define the system costs
2. Total revenues are distributed according to kms run.
3. No fixed rate per km,
4. Share of the total pot of revenue goes to the operator.
5. If the pot grows, the operators get more – incentive
6. If it is small the operators get less - risk

Penalties and bonuses are built into the contracts for service quality

TransMilenio: Bogota

- Multiple contracts
  - 7 trunk bus contracts (5 different contractors)
  - 6 feeder area contracts (4 different contractors)
  - 2 fare collection contracts (1 contractor)
  - 1 trust fund
  - Multiple outsourcing contracts (safety, maintenance, station cleaning, user information systems, advertisements)

TransMilenio: Bogota

- Competitive bidding – with priority to existing operators
- Performance based – strong penalties for non compliance
- Limited time – according to equipment lifecycle
  - Trunk buses 850,000 km fleet average, max 1 million km per bus
- Technically defined user fare

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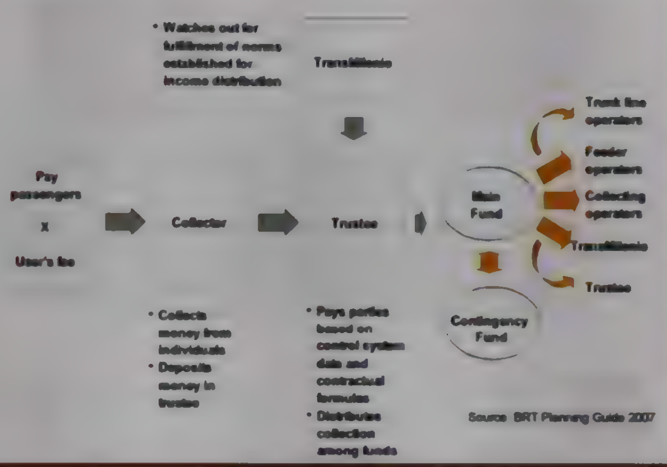
Flow of funds to system agents



Pay passengers
x
User's fee

Collector
- Collects money from individuals
- Deposits money in trustee

TransMilenio
- Watches out for fulfillment of norms established for income distribution

Trustee
- Pays parties based on control system data and contractual formulas
- Distributes collection among funds

Main Fund

Contingency Fund

Trunk line operators

Feeder operators

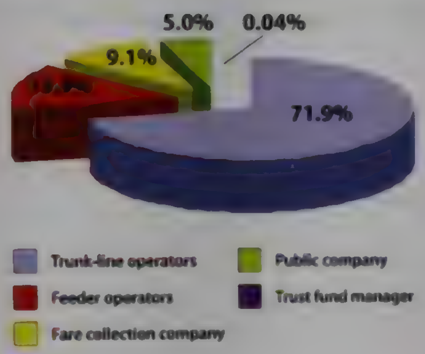
Collecting operators

TransMilenio

Trustee

Source: BRT Planning Guide 2007

Revenue Distribution



Trunk-line operators	Public company
Feeder operators	Trust fund manager
Fare collection company	

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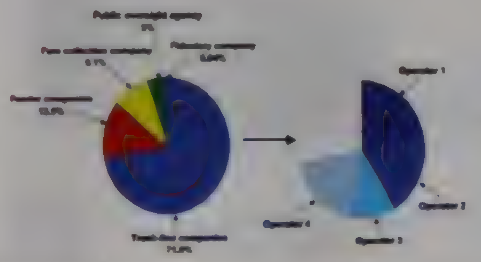
Source: BRT Planning Guide 2007

Payment is based on Km, but encompass risk sharing by the operators

$$ShareOperator_i = \frac{Km_i * Cost_i}{\sum_j Km_j * Cost_j}$$



Source: BRT Planning Guide 2007

Mixed Approaches

Advantages

1. No incentive to run empty kms in the off-peak hours.
2. Has to maintain a load factor (IPK), 4.75 passengers per km.
3. Operator is taking demand risks

Disadvantages

1. Formulation is complex. The proposition to the operators is not straightforward.
2. Payments are based on km. The cost is not a function directly of the bus-km. As a result the operator has no incentive to bring in additional buses in the peak hour. This causes the overcrowding problems.

Requires a formulation based on the number of buses and the number of km, not just kms. The idea is to ask the operator to bring in an additional bus when the load factor (IPK) goes over a certain threshold.

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KEY FACTORS FOR IMPLEMENTING SUCESSFUL BUS SYSTEM REFORMS

- Strong leadership in the decision making process
- Local institution leads technical planning and is based on demand data
- Bus priority and segregation
- Use of technology
- Creating an environment for equal sharing of risks and incentives between system planner and system operator
- Financial analysis, shortfall and the need for subsidy
- System performance monitoring and user feedback

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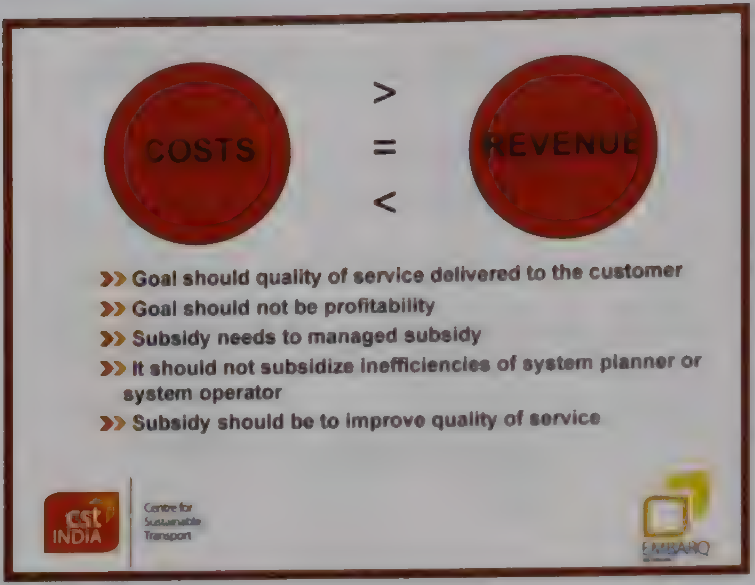

- Goal should quality of service delivered to the customer
- Goal should not be profitability
- Subsidy needs to managed subsidy
- It should not subsidize inefficiencies of system planner or system operator
- Subsidy should be to improve quality of service

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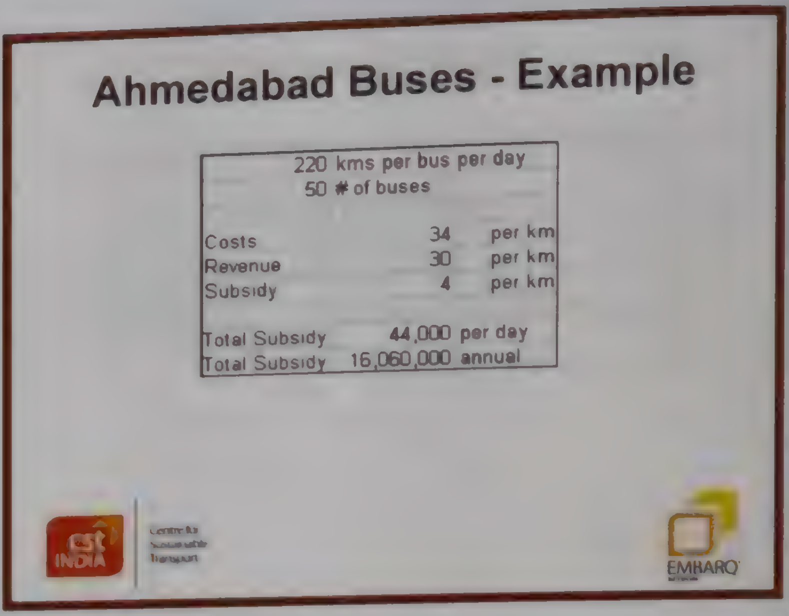

Ahmedabad Buses - Example

220 kms per bus per day		
50 # of buses		
Costs	34	per km
Revenue	30	per km
Subsidy	4	per km
Total Subsidy	44,000	per day
Total Subsidy	16,060,000	annual

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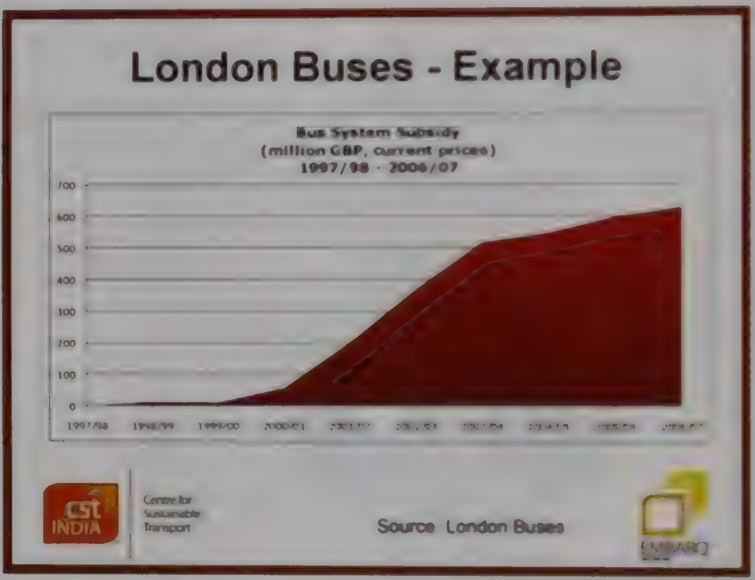
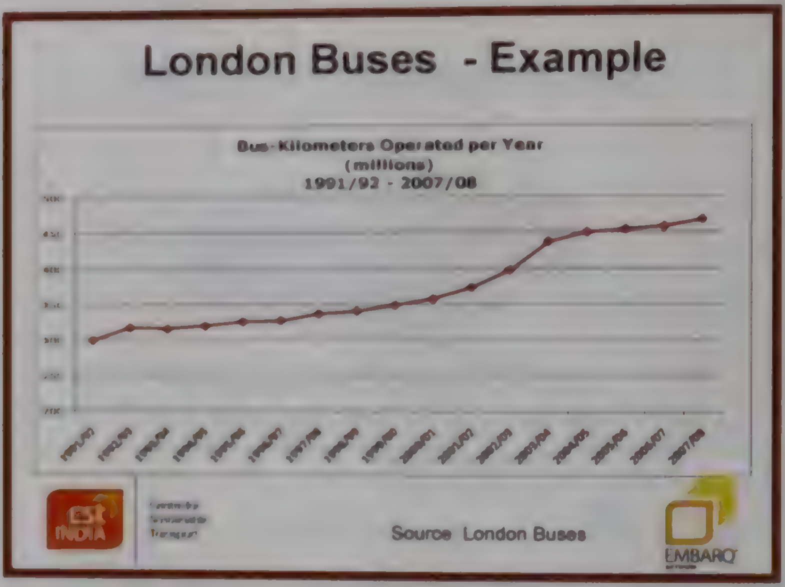


London Buses - Example

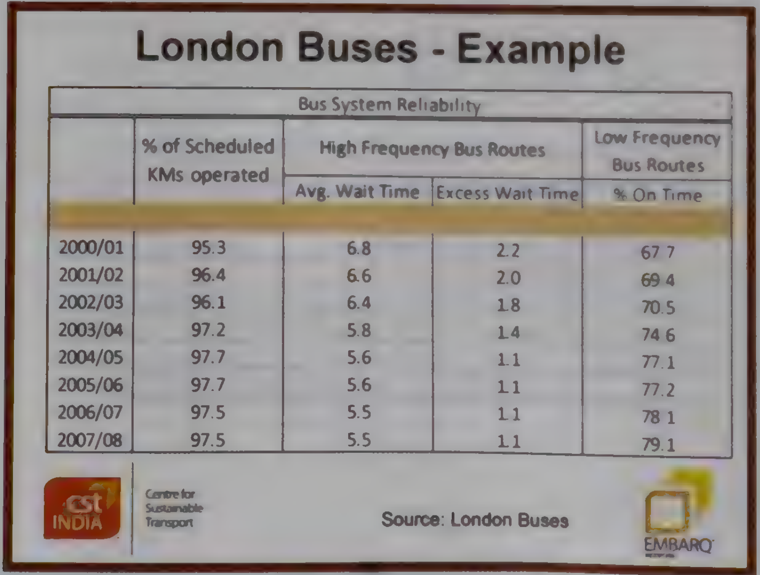
Centre for Sustainable Transport

Source London Buses



London Buses - Example

Source London Buses



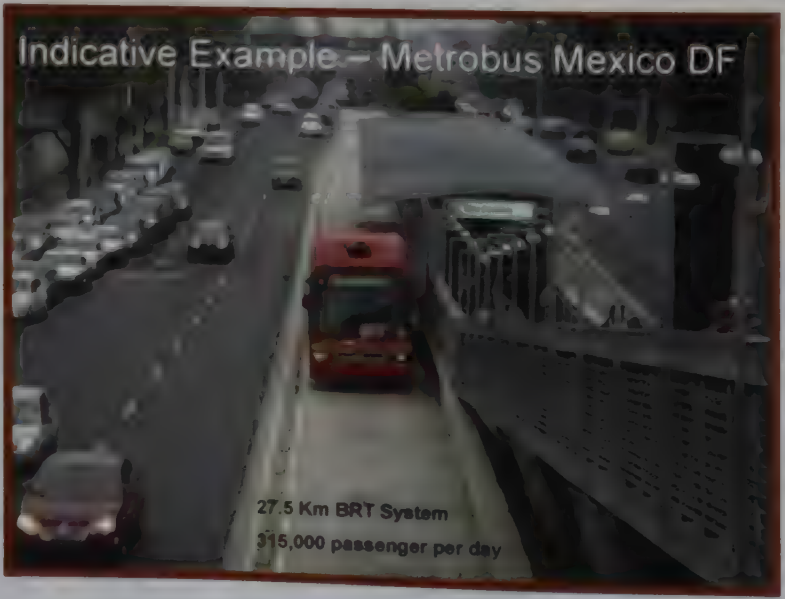
London Buses - Example

Bus System Reliability

	% of Scheduled KMs operated	High Frequency Bus Routes		Low Frequency Bus Routes
		Avg. Wait Time	Excess Wait Time	% On Time
2000/01	95.3	6.8	2.2	67.7
2001/02	96.4	6.6	2.0	69.4
2002/03	96.1	6.4	1.8	70.5
2003/04	97.2	5.8	1.4	74.6
2004/05	97.7	5.6	1.1	77.1
2005/06	97.7	5.6	1.1	77.2
2006/07	97.5	5.5	1.1	78.1
2007/08	97.5	5.5	1.1	79.1

Centre for Sustainable Transport

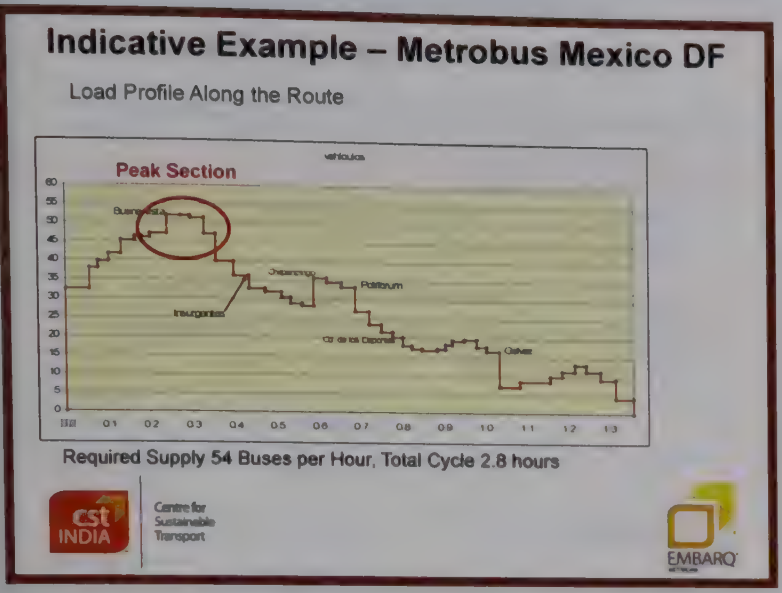
Source: London Buses



Indicative Example – Metrobus Mexico DF

27.5 Km BRT System

315,000 passenger per day



Indicative Example – Metrobus Mexico DF

Load Profile Along the Route

Required Supply 54 Buses per Hour, Total Cycle 2.8 hours

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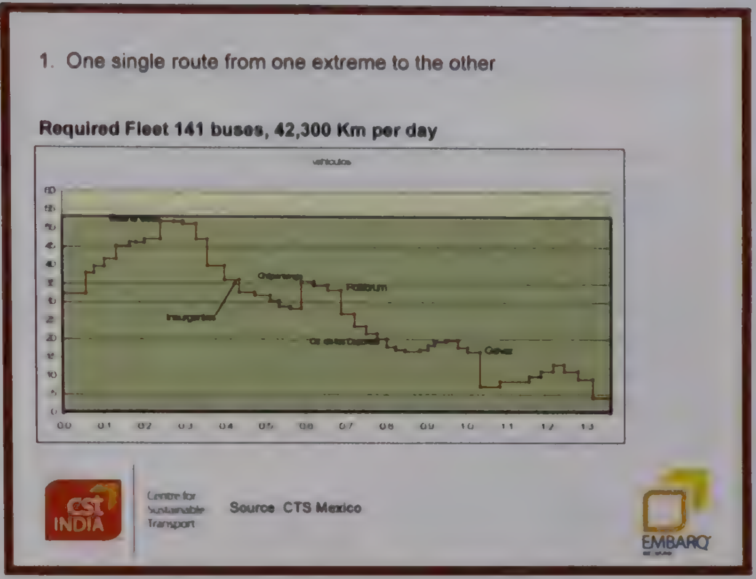
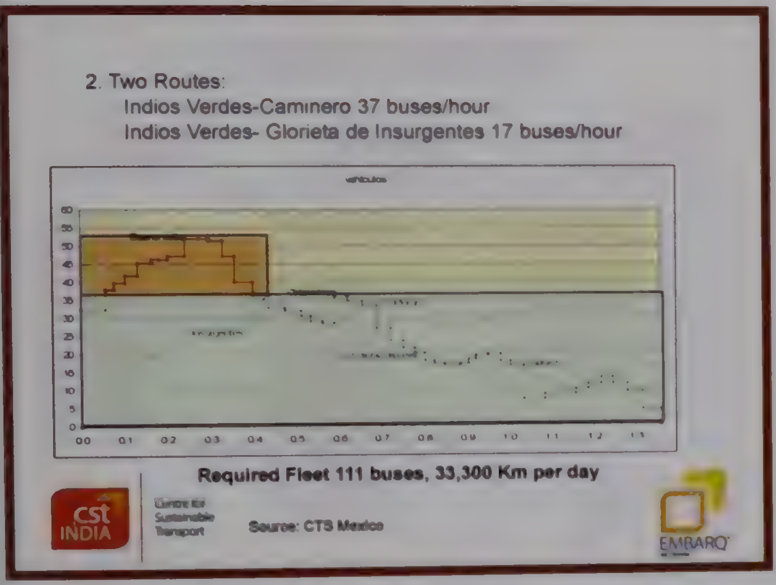


1. One single route from one extreme to the other

Required Fleet 141 buses, 42,300 Km per day

Centre for Sustainable Transport

Source: CTS Mexico

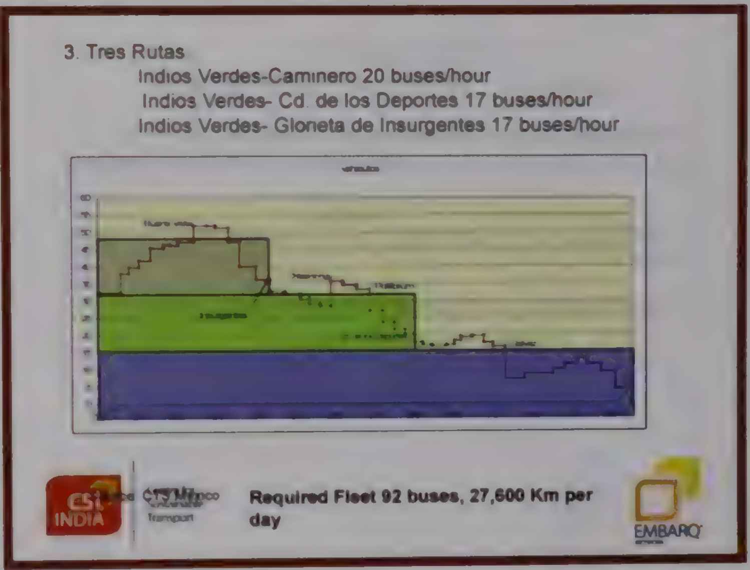


2. Two Routes:
   Indios Verdes-Caminero 37 buses/hour
   Indios Verdes- Glorieta de Insurgentes 17 buses/hour

Required Fleet 111 buses, 33,300 Km per day

Centre for Sustainable Transport

Source: CTS Mexico

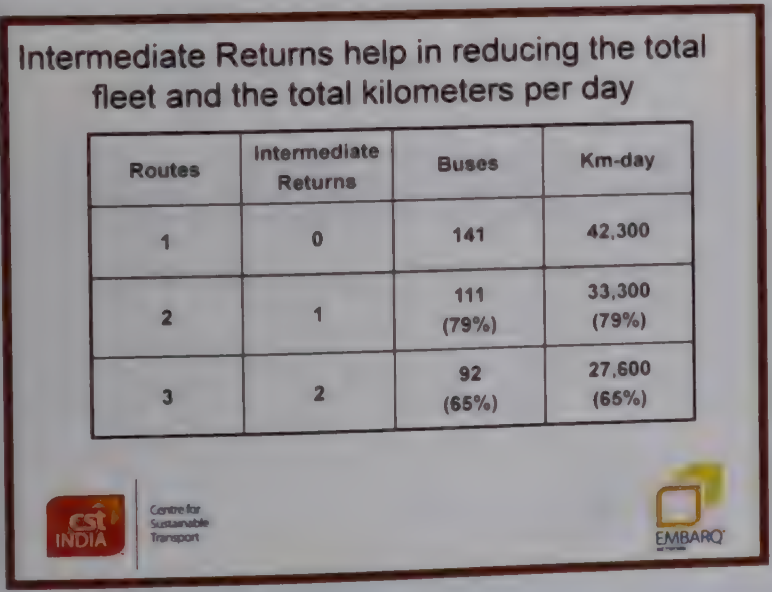


3. Tres Rutas
   Indios Verdes-Caminero 20 buses/hour
   Indios Verdes- Cd. de los Deportes 17 buses/hour
   Indios Verdes- Gloneta de Insurgentes 17 buses/hour

Source: CTS Mexico

Centre for Sustainable Transport

Required Fleet 92 buses, 27,600 Km per day



Intermediate Returns help in reducing the total fleet and the total kilometers per day

Routes	Intermediate Returns	Buses	Km-day
1	0	141	42,300
2	1	111 (79%)	33,300 (79%)
3	2	92 (65%)	27,600 (65%)

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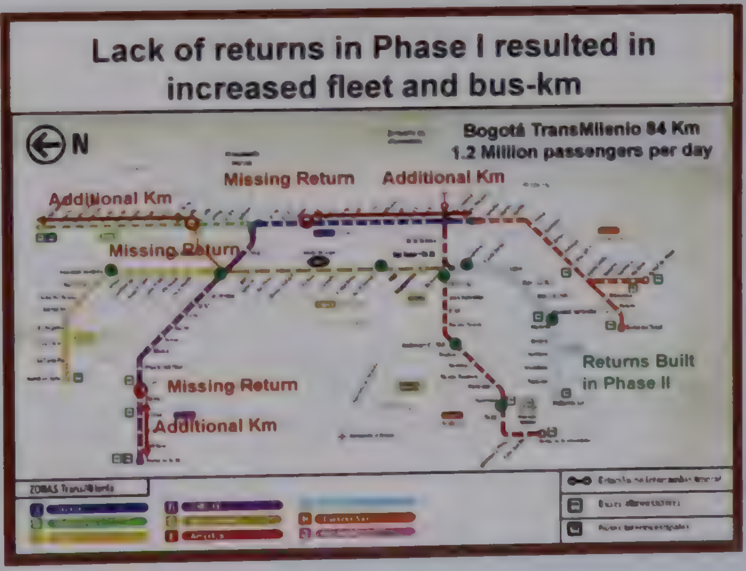
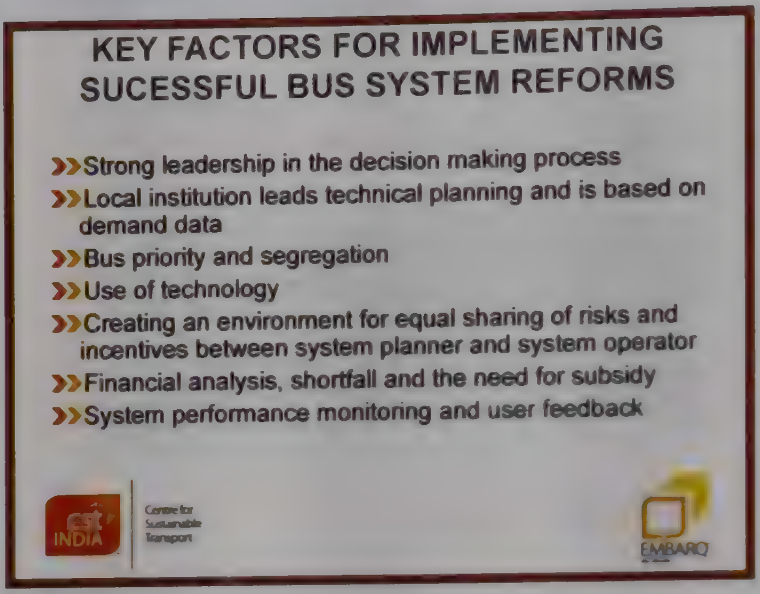


Lack of returns in Phase I resulted in increased fleet and bus-km



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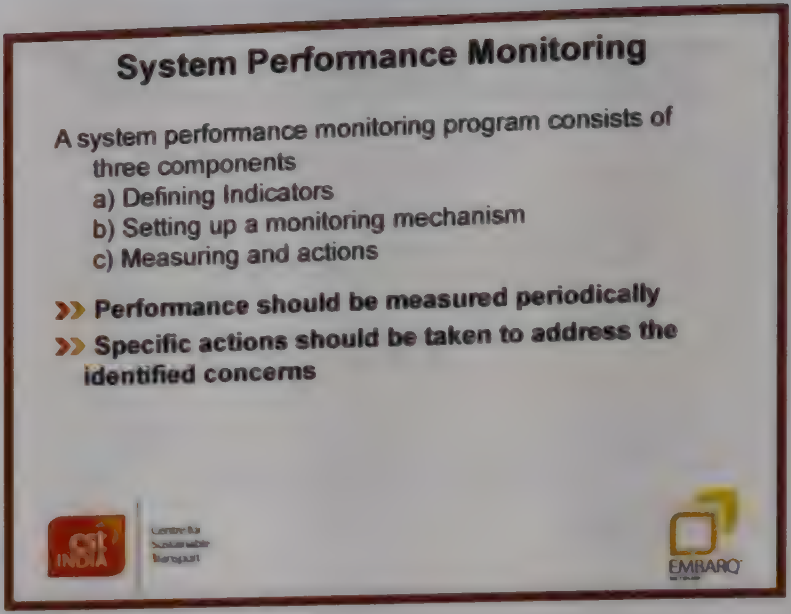
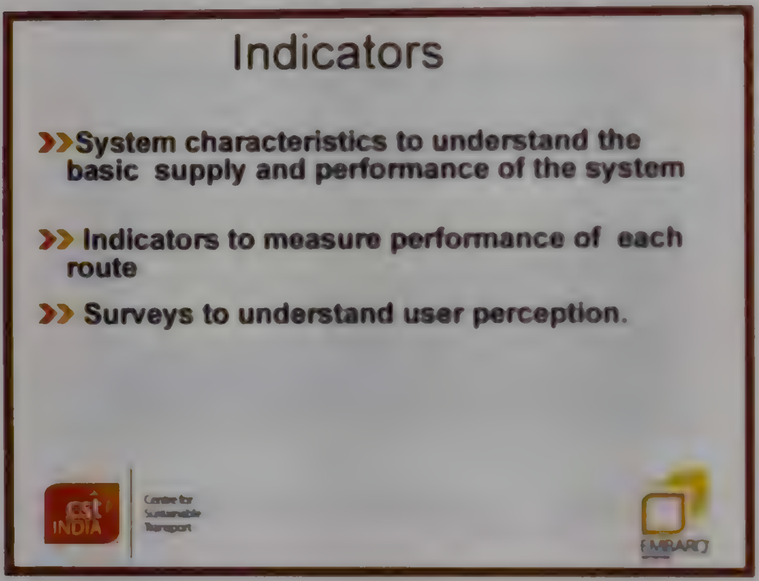


System Performance Monitoring

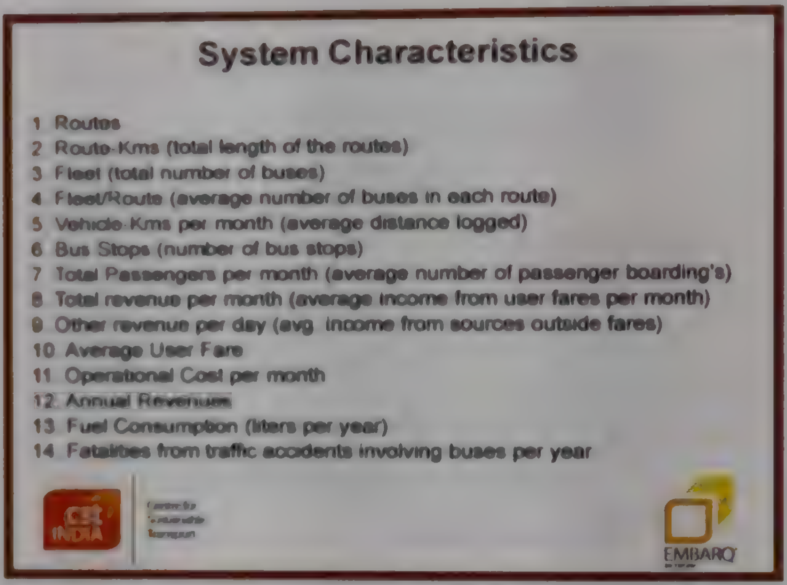
A system performance monitoring program consists of three components
a) Defining Indicators
b) Setting up a monitoring mechanism
c) Measuring and actions

- **Performance should be measured periodically**
- **Specific actions should be taken to address the identified concerns**



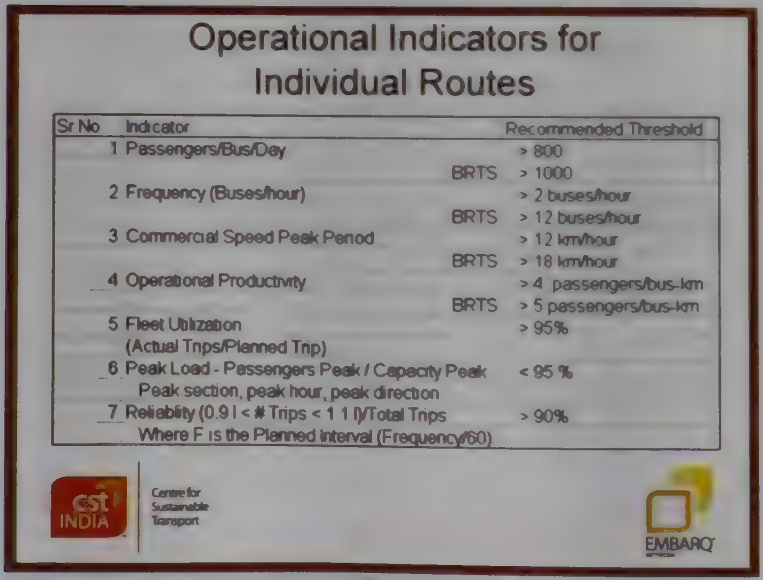
Indicators

- **System characteristics to understand the basic supply and performance of the system**
- **Indicators to measure performance of each route**
- **Surveys to understand user perception.**



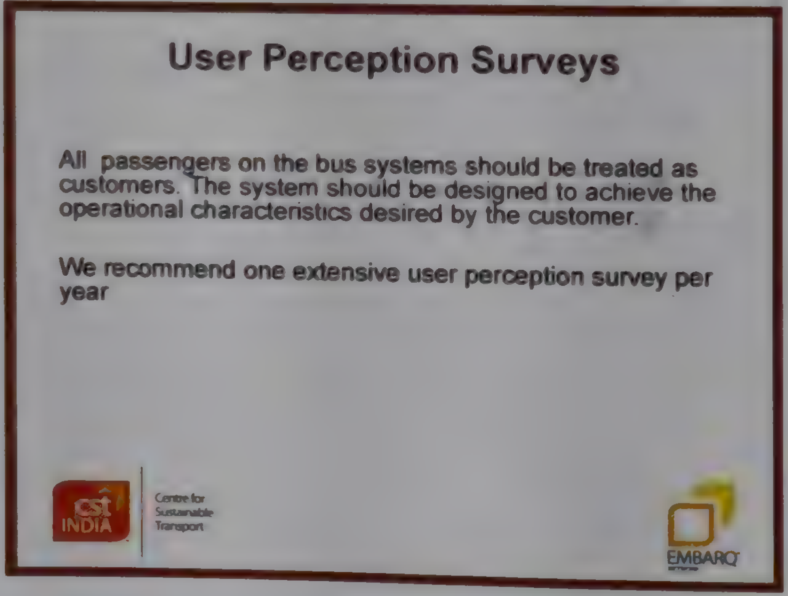
System Characteristics

1 Routes
2 Route-Kms (total length of the routes)
3 Fleet (total number of buses)
4 Fleet/Route (average number of buses in each route)
5 Vehicle-Kms per month (average distance logged)
6 Bus Stops (number of bus stops)
7 Total Passengers per month (average number of passenger boarding's)
8 Total revenue per month (average income from user fares per month)
9 Other revenue per day (avg income from sources outside fares)
10 Average User Fare
11 Operational Cost per month
12 Annual Revenues
13 Fuel Consumption (liters per year)
14 Fatalities from traffic accidents involving buses per year



Operational Indicators for Individual Routes

Sr No	Indicator		Recommended Threshold
1	Passengers/Bus/Day		> 800
		BRTS	> 1000
2	Frequency (Buses/hour)		> 2 buses/hour
		BRTS	> 12 buses/hour
3	Commercial Speed Peak Period		> 12 km/hour
		BRTS	> 18 km/hour
4	Operational Productivity		> 4 passengers/bus-km
		BRTS	> 5 passengers/bus-km
5	Fleet Utilization (Actual Trips/Planned Trip)		> 95%
6	Peak Load - Passengers Peak / Capacity Peak Peak section, peak hour, peak direction		< 95 %
7	Reliability (0.9 I < # Trips < 1 1 I)/Total Trips Where F is the Planned Interval (Frequency/60)		> 90%



User Perception Surveys

All passengers on the bus systems should be treated as customers. The system should be designed to achieve the operational characteristics desired by the customer.

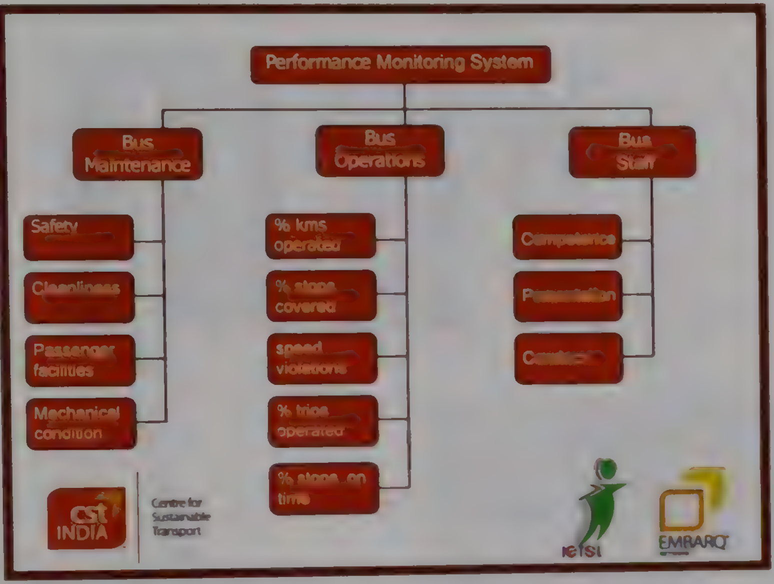
We recommend one extensive user perception survey per year

London Buses – Example

TfL Bus System Monitoring Systems

Service Aspect	Monitoring Metric	Data Collection Method	Scope
Reliability (High Frequency Routes)	Average Wait Time, Excess Wait Time	Road side monitoring	3-5% of operations
Reliability (Low Frequency Routes)	On-Time Percentage	Road side monitoring	3-5% of operations
Vehicle Quality	Vehicle condition (aesthetic)	Static Audits at Bus stops	~17,000 annually
Driver Quality (Customer Service)	Customer experience	Mystery Traveller Surveys	~33,000 annually
Driver Quality (Technical)	Driver ability and performance	Technical assessment	~6,500 annually
Engineering and Mechanical Quality	Vehicle condition (mechanical)	Technical assessment	~25% of fleet
Customer Satisfaction	Customer Satisfaction	Passenger surveys	n/a
Contract Compliance	Administrative and Reporting systems	n/a	n/a

Atal Indore City Transport Services Limited

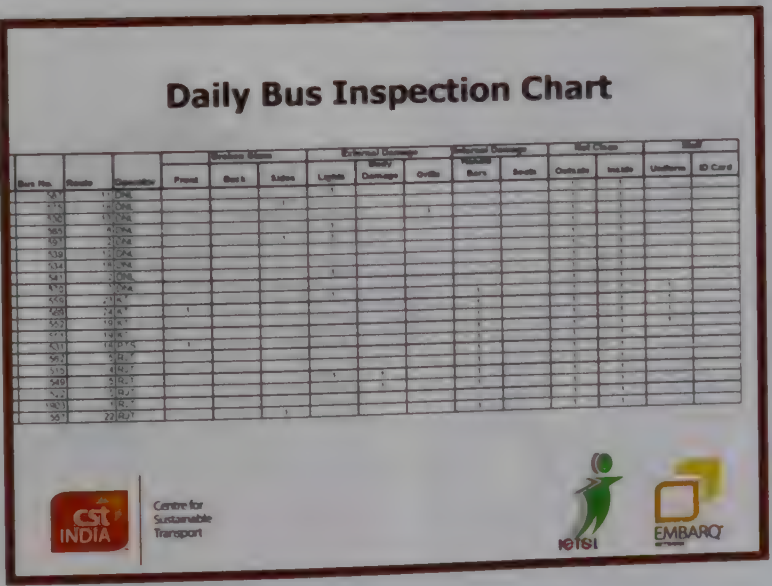


Performance Monitoring System

- Bus Maintenance
  - Safety
  - Cleanliness
  - Passenger facilities
  - Mechanical condition
- Bus Operations
  - % kms operated
  - % stops covered
  - speed violations
  - % trips operated
  - % stops on time
- Bus Staff
  - Competence
  - Presentation
  - Conduct

Monitoring Methods – Agency

Database	Data Generating Component	Database Administrator
Daily GPS Summary	GPS Unit On-Board Bus	Arya Omnitalk
Daily Bus Inspection	ICTSL Monitors	AICTSL
User Satisfaction Survey	On-board Feedback Box	AICTSL
User Feedback	Telephone, Internet	AICTSL



Daily Bus Inspection Chart

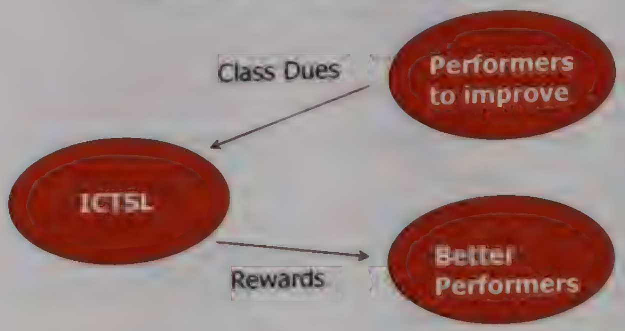
Monthly Operations Performance Data Report

Route	Operator	MM/YY					
		% Trips Operated	% Stops Covered	% Km Operated	Speed Violations per 100 km	% Stops on time	RATING

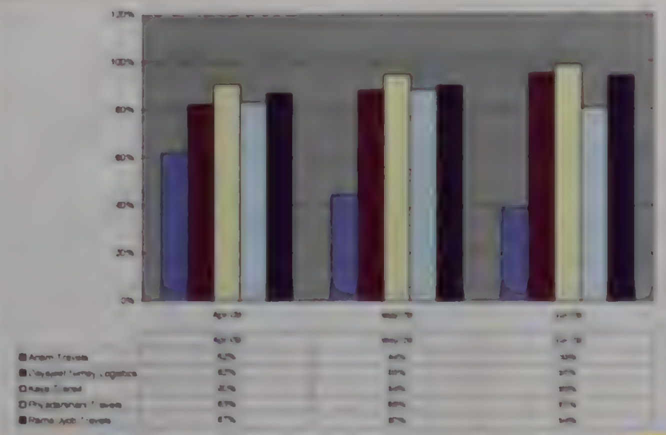
Performance Rating Classes

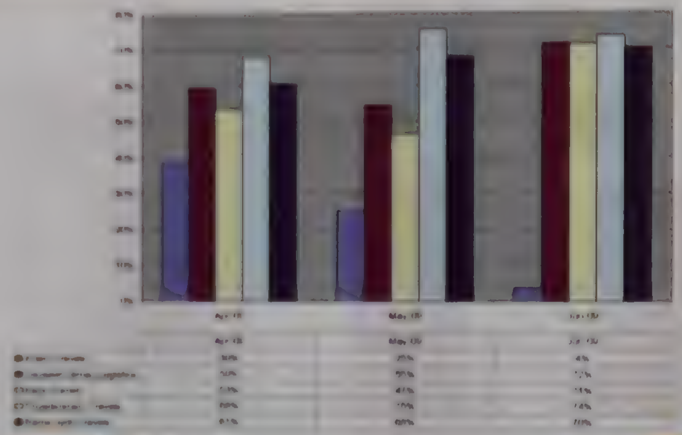
Performance Class	Class I	Class II	Class III	Class IV
Score for each Parameter	Over 95	75 to 95	50 to 75	Under 50
Penalty Amount	Rs. 0/-	Rs. 100/-	Rs. 200/-	Rs. 300/-

Dues and Rewards



- Best Performing Route
- Best Performing Bus
- Most Reliable Route
- Best Consistent Bus
- Most Improved Bus


% KM actually operated


% Trips actually operated

Best Performing Routes for June

Route No.	Operator	Rating	Class
23	Kaya Transit	84	II
10	Rama Jyoti Travels	81	II
19	Kaya Transit	79	II
13	Dayajeet Nimay Logistics	79	II
6	Dayajeet Nimay Logistics	79	II

Centers:
Mexico
Brazil
Turkey
India
Andes

Question and Answer:

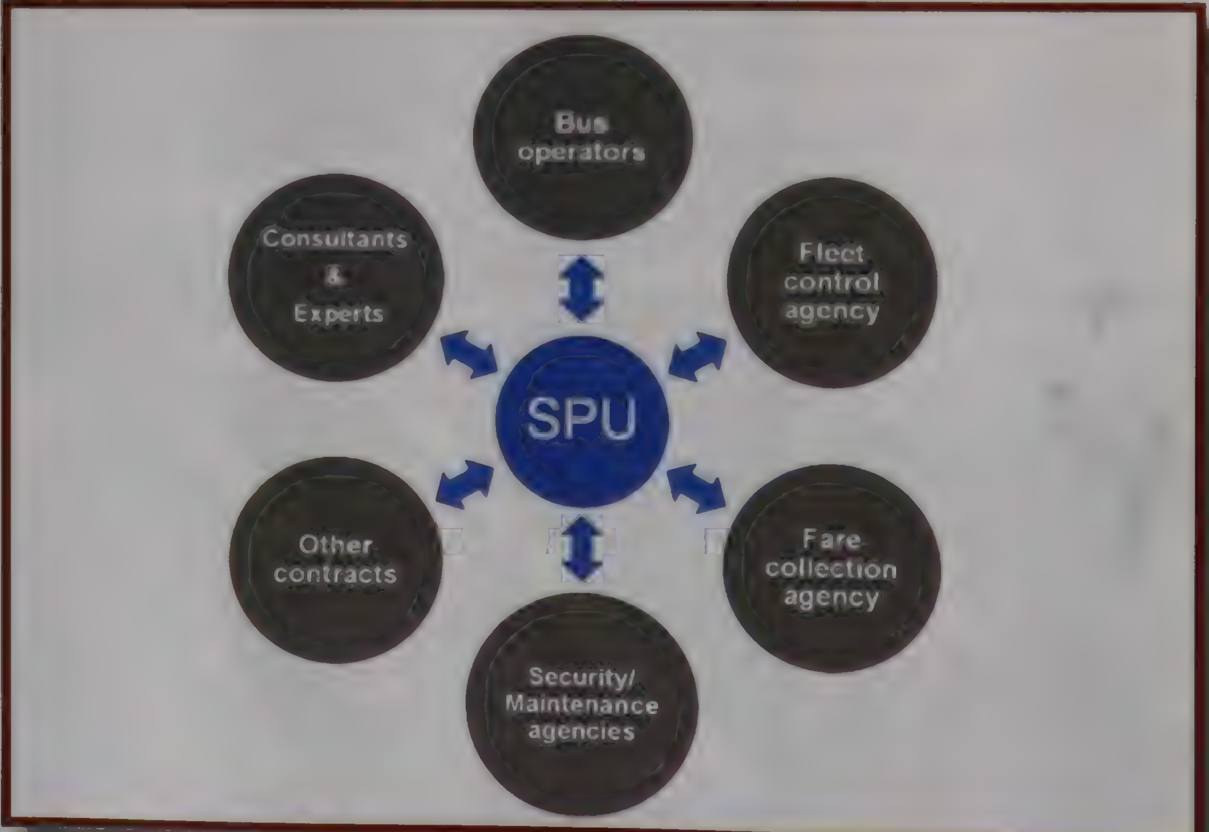
Q.While calculating the cost and benefit is there any particular study that you have done at the social cost benefit analysis of the BRT because there could be hidden benefits in terms of congestion, air pollution etc. (Mr. Vinay , Center for Science , Technology and Policy)

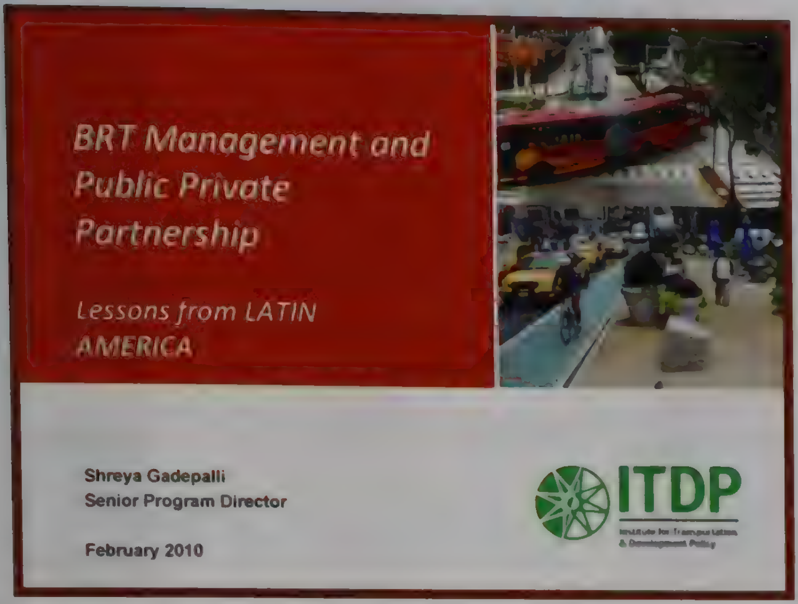
Ans. Speaker said it's a very good example of measuring co-benefits. It's very essential to measure the co-benefits in any study. Speaker also explained about the comprehensive co-benefit study that was carried out in 2008 for Mexico Metro Bus project.

The co-benefit study was done by INE in partnership with their center in Mexico. It measures various co-benefits such as increased productivity because of not falling sick etc. He also explained that it's very expansive to measure co-benefits, but it is recommended in measuring in all our projects.

Session 5: BRT Management and Public Private Partnership

Ms. Shreya Gadepalli explained the concept of emergence of 'unregulated private market' with the help of cycle showing the process of evolution. She explained the components where BRTS projects normally overlooks like institutional capacity building, system optimization, mechanism for institution & organizational structure and leveraging the private resources for the benefits of public. The speaker demonstrated the various contracting options with its pros and cons in PPP to execute BRTS.





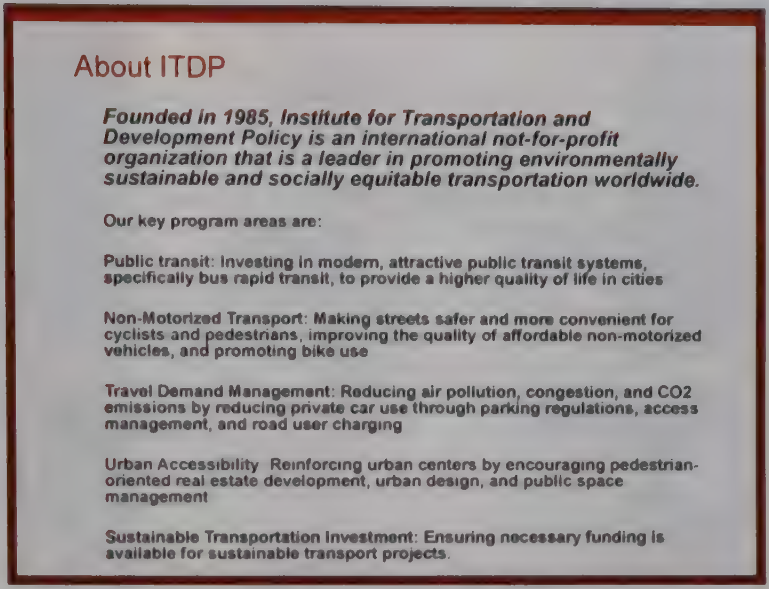
BRT Management and Public Private Partnership

Lessons from LATIN AMERICA

Shreya Gadepalli
Senior Program Director

February 2010

ITDP
Institute for Transportation & Development Policy



About ITDP

Founded in 1985, Institute for Transportation and Development Policy is an international not-for-profit organization that is a leader in promoting environmentally sustainable and socially equitable transportation worldwide.

Our key program areas are:

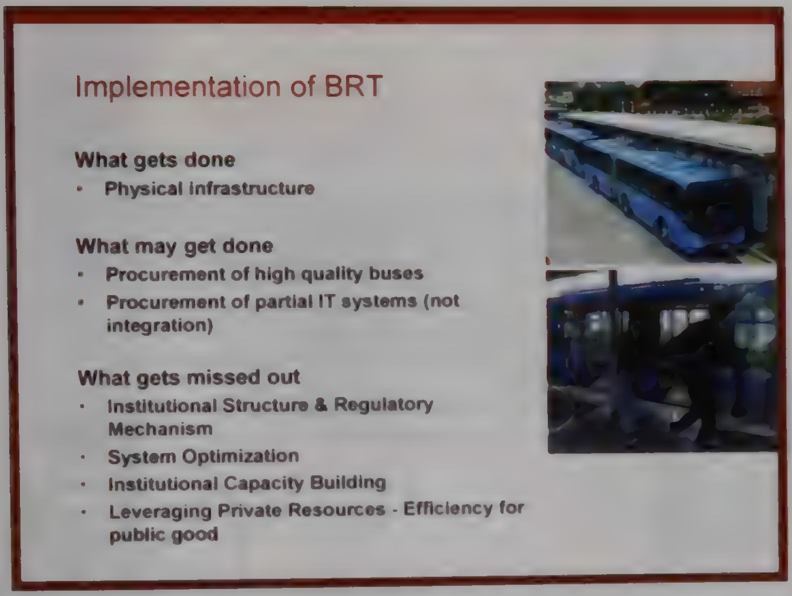
Public transit: Investing in modern, attractive public transit systems, specifically bus rapid transit, to provide a higher quality of life in cities

Non-Motorized Transport: Making streets safer and more convenient for cyclists and pedestrians, improving the quality of affordable non-motorized vehicles, and promoting bike use

Travel Demand Management: Reducing air pollution, congestion, and CO2 emissions by reducing private car use through parking regulations, access management, and road user charging

Urban Accessibility: Reinforcing urban centers by encouraging pedestrian-oriented real estate development, urban design, and public space management

Sustainable Transportation Investment: Ensuring necessary funding is available for sustainable transport projects.

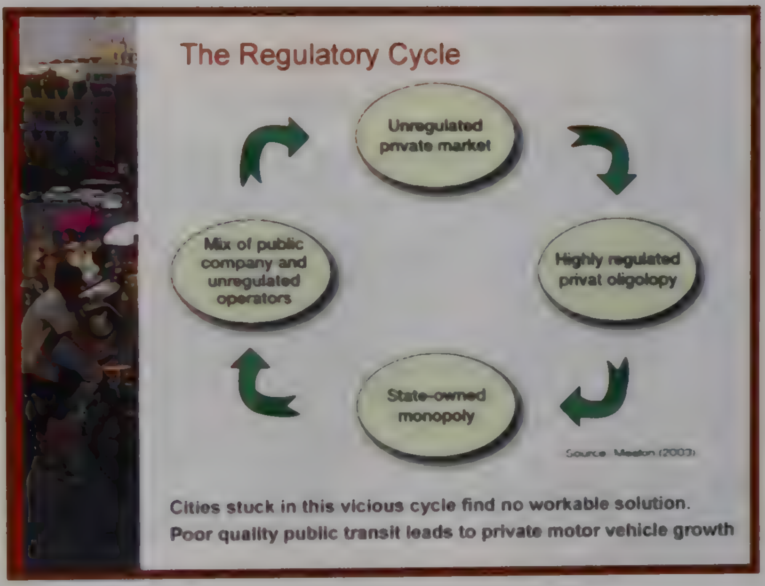


Implementation of BRT

What gets done
- Physical infrastructure

What may get done
- Procurement of high quality buses
- Procurement of partial IT systems (not integration)

What gets missed out
- Institutional Structure & Regulatory Mechanism
- System Optimization
- Institutional Capacity Building
- Leveraging Private Resources - Efficiency for public good



The Regulatory Cycle

Unregulated private market

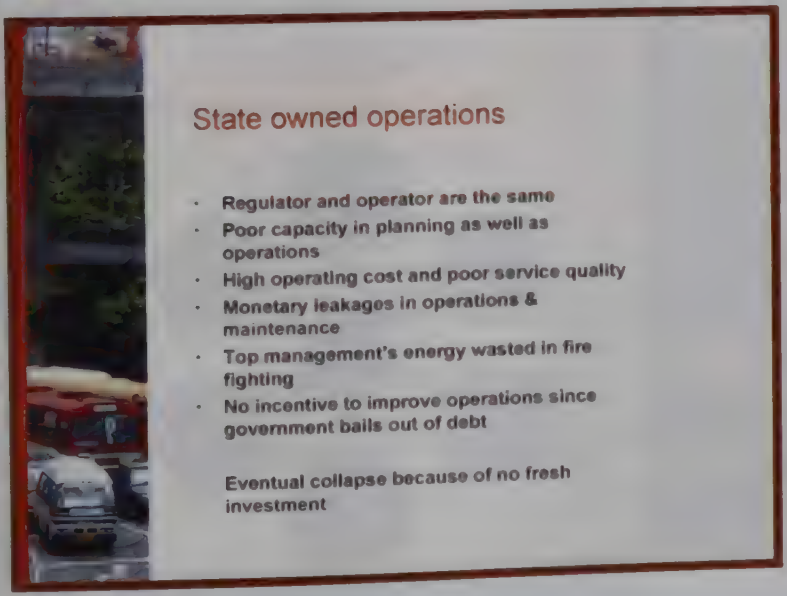
Highly regulated privat oligopoly

State-owned monopoly

Mix of public company and unregulated operators

Source: Meaton (2003)

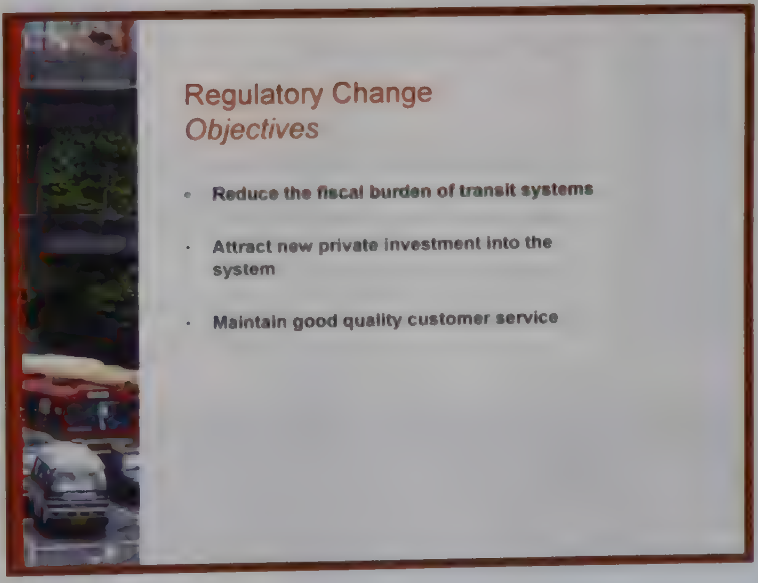
Cities stuck in this vicious cycle find no workable solution.
Poor quality public transit leads to private motor vehicle growth



State owned operations

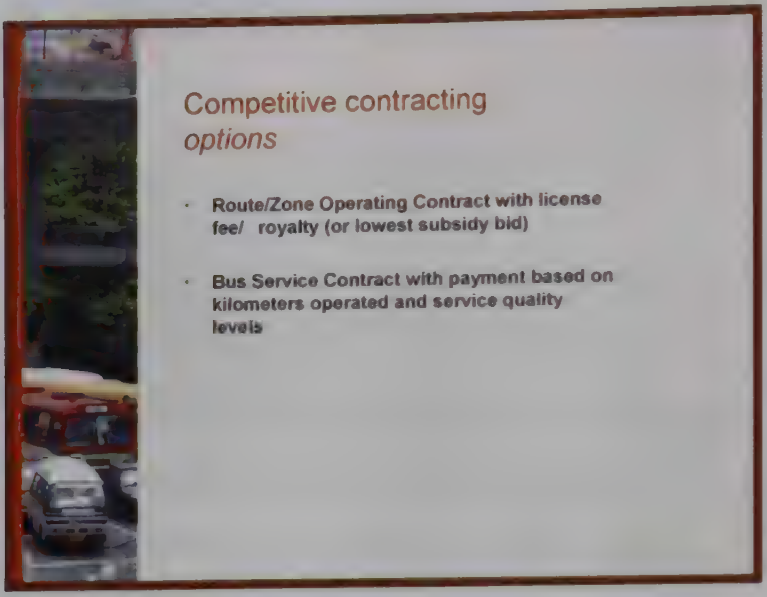
- Regulator and operator are the same
- Poor capacity in planning as well as operations
- High operating cost and poor service quality
- Monetary leakages in operations & maintenance
- Top management's energy wasted in fire fighting
- No incentive to improve operations since government bails out of debt

Eventual collapse because of no fresh investment



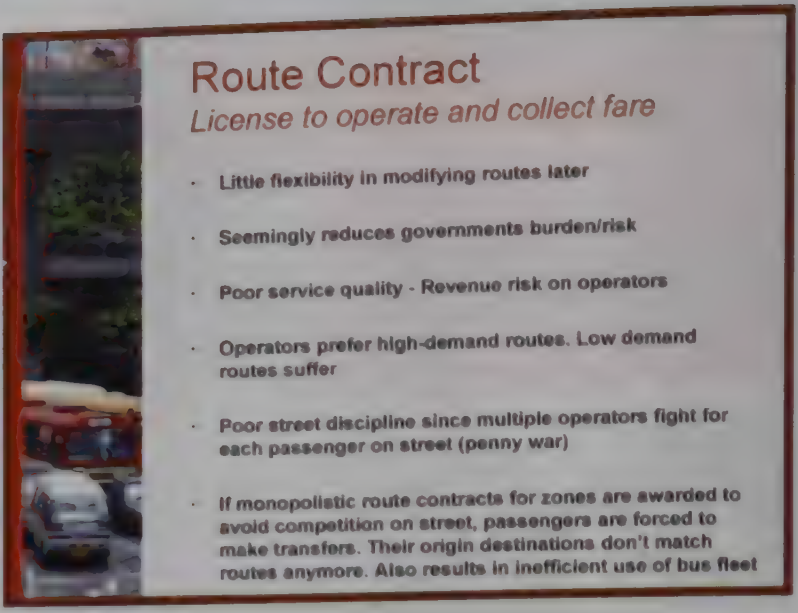
Regulatory Change
Objectives

- Reduce the fiscal burden of transit systems
- Attract new private investment into the system
- Maintain good quality customer service



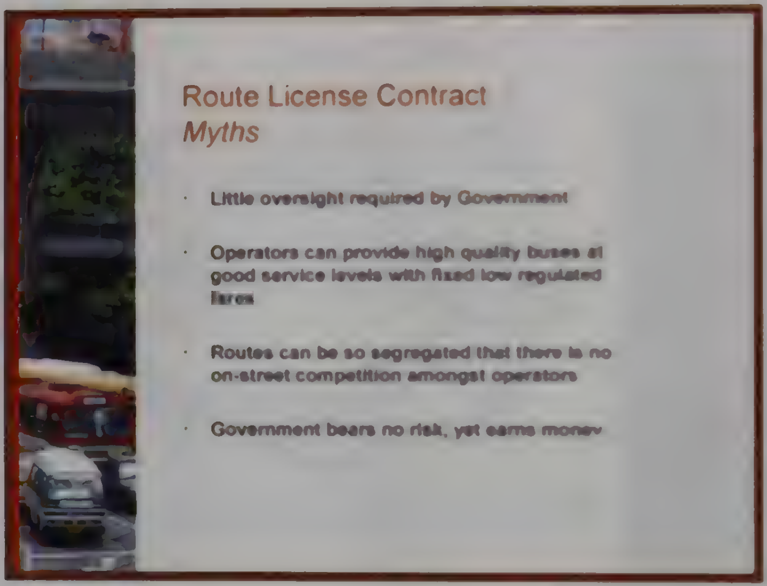
Competitive contracting
options

- Route/Zone Operating Contract with license fee/ royalty (or lowest subsidy bid)
- Bus Service Contract with payment based on kilometers operated and service quality levels



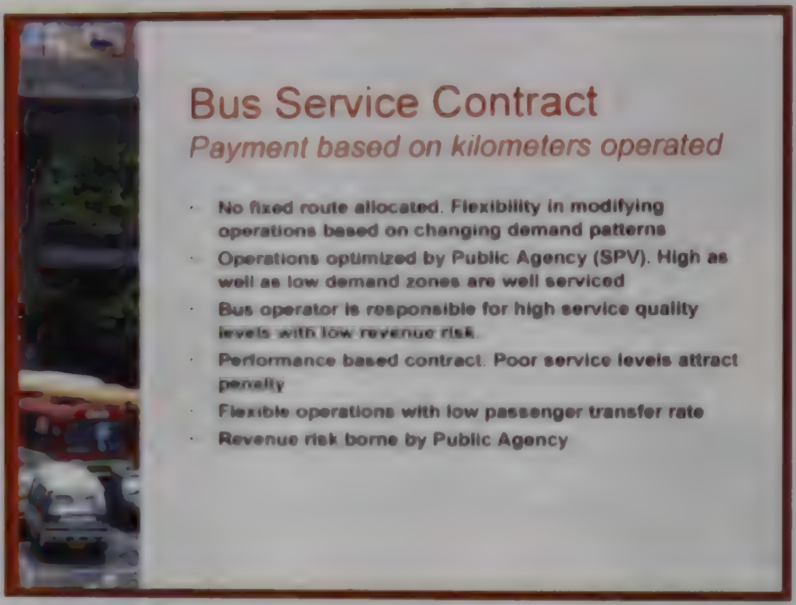
Route Contract
License to operate and collect fare

- Little flexibility in modifying routes later
- Seemingly reduces governments burden/risk
- Poor service quality - Revenue risk on operators
- Operators prefer high-demand routes. Low demand routes suffer
- Poor street discipline since multiple operators fight for each passenger on street (penny war)
- If monopolistic route contracts for zones are awarded to avoid competition on street, passengers are forced to make transfers. Their origin destinations don't match routes anymore. Also results in inefficient use of bus fleet



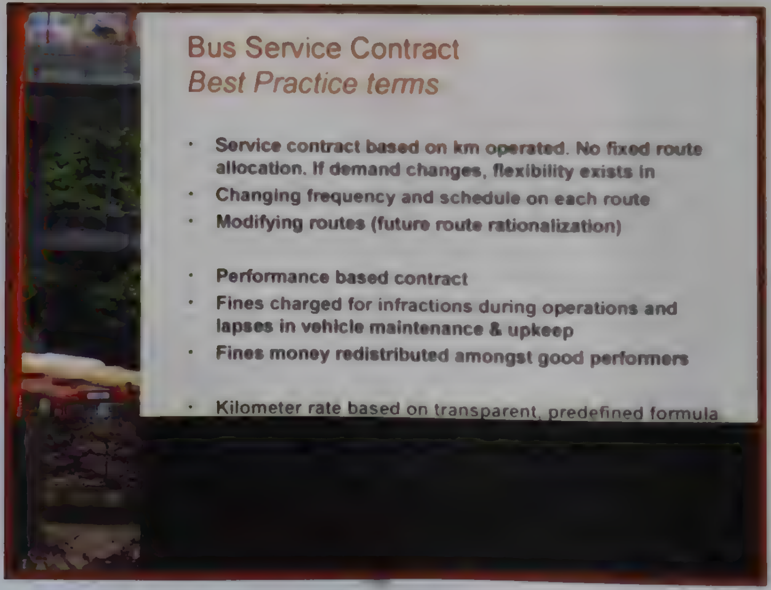
Route License Contract
Myths

- Little oversight required by Government
- Operators can provide high quality buses at good service levels with fixed low regulated fares
- Routes can be so segregated that there is no on-street competition amongst operators
- Government bears no risk, yet earns money



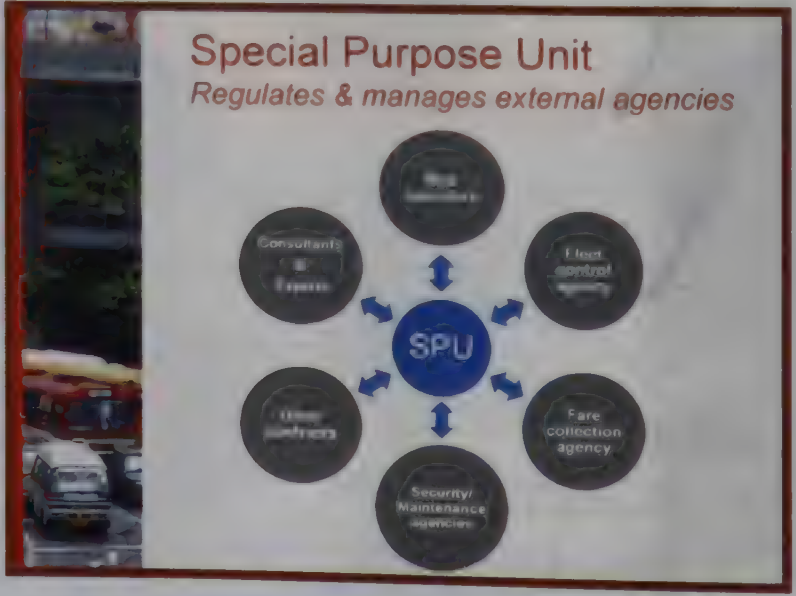
Bus Service Contract
Payment based on kilometers operated

- No fixed route allocated. Flexibility in modifying operations based on changing demand patterns
- Operations optimized by Public Agency (SPV). High as well as low demand zones are well serviced
- Bus operator is responsible for high service quality levels with low revenue risk.
- Performance based contract. Poor service levels attract penalty
- Flexible operations with low passenger transfer rate
- Revenue risk borne by Public Agency

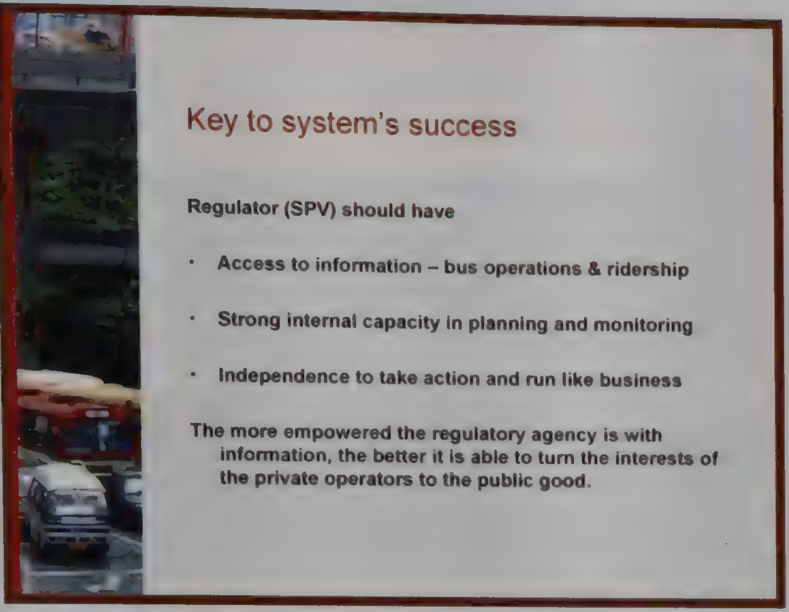


Bus Service Contract
Best Practice terms

- Service contract based on km operated. No fixed route allocation. If demand changes, flexibility exists in
- Changing frequency and schedule on each route
- Modifying routes (future route rationalization)
- Performance based contract
- Fines charged for infractions during operations and lapses in vehicle maintenance & upkeep
- Fines money redistributed amongst good performers
- Kilometer rate based on transparent, predefined formula



Special Purpose Unit
Regulates & manages external agencies

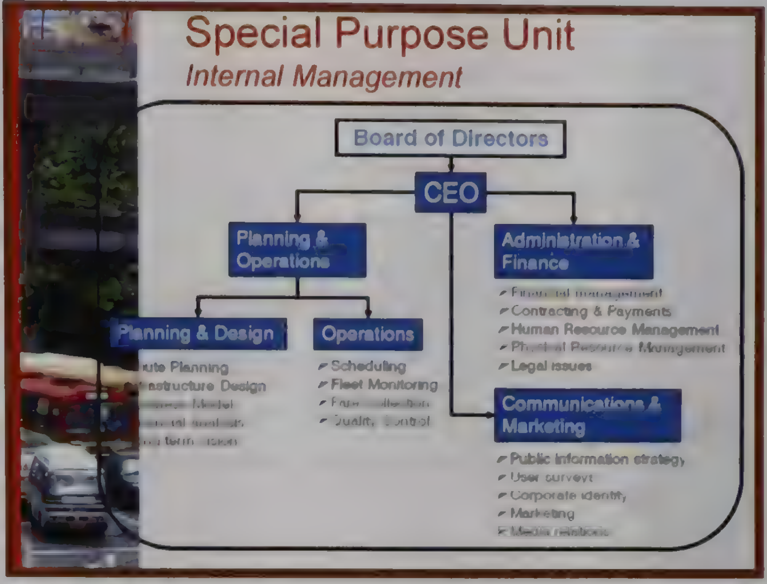


Key to system's success

Regulator (SPV) should have

- Access to information – bus operations & ridership
- Strong internal capacity in planning and monitoring
- Independence to take action and run like business

The more empowered the regulatory agency is with information, the better it is able to turn the interests of the private operators to the public good.



Special Purpose Unit
Internal Management

Board of Directors

CEO

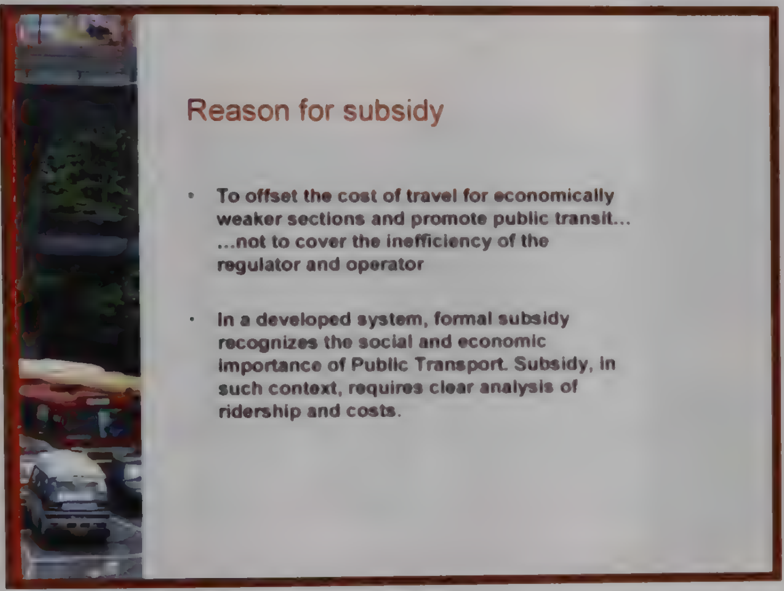
Planning & Operations

Planning & Design
- ute Planning
- astructure Design
- Model
- analysis
- term vision

Operations
- Scheduling
- Fleet Monitoring
- Fare collection
- Quality Control

Administration & Finance
- Financial management
- Contracting & Payments
- Human Resource Management
- Physical Resource Management
- Legal issues

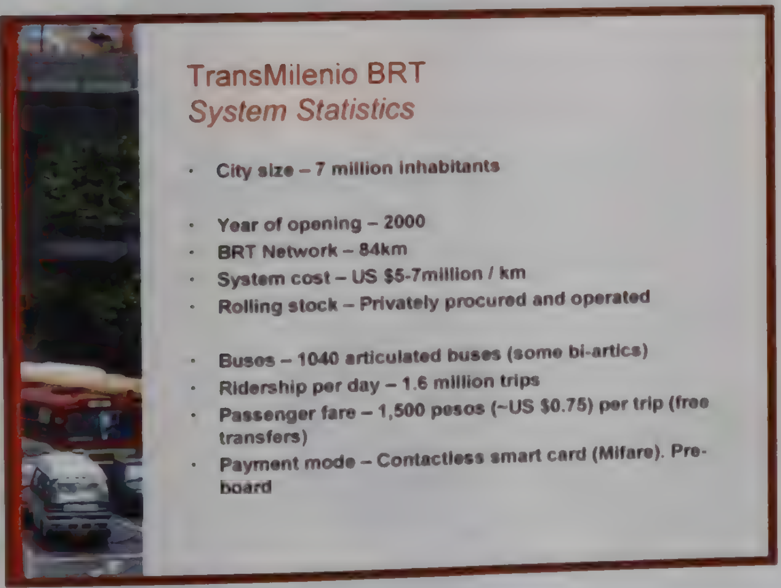
Communications & Marketing
- Public information strategy
- User surveys
- Corporate identity
- Marketing
- Media relations



Reason for subsidy

- To offset the cost of travel for economically weaker sections and promote public transit… …not to cover the inefficiency of the regulator and operator
- In a developed system, formal subsidy recognizes the social and economic importance of Public Transport. Subsidy, in such context, requires clear analysis of ridership and costs.

Case study – Bogota
TransMilenio BRT

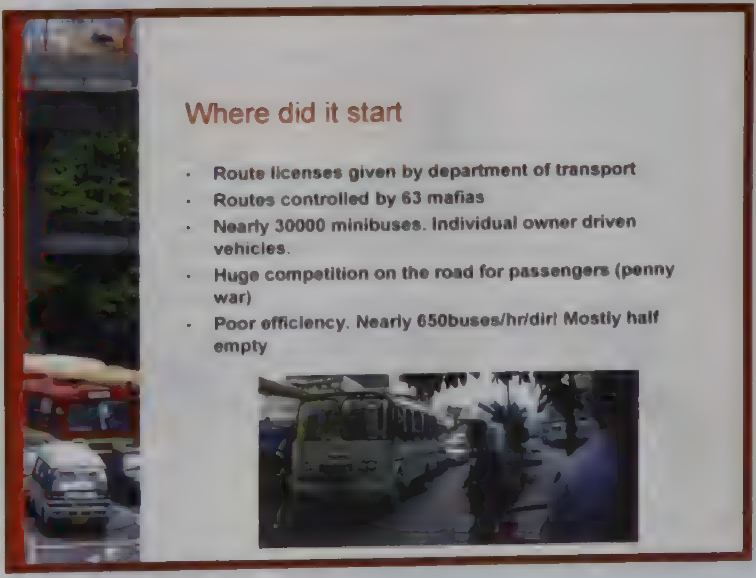


TransMilenio BRT
System Statistics

- City size – 7 million inhabitants

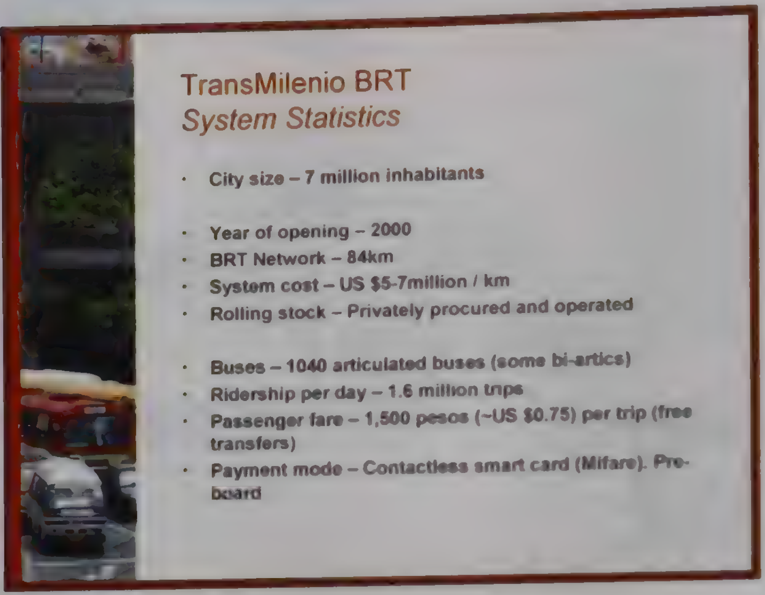
- Year of opening – 2000
- BRT Network – 84km
- System cost – US $5-7million / km
- Rolling stock – Privately procured and operated

- Buses – 1040 articulated buses (some bi-artics)
- Ridership per day – 1.6 million trips
- Passenger fare – 1,500 pesos (~US $0.75) per trip (free transfers)
- Payment mode – Contactless smart card (Mifare). Pre-board



Where did it start

- Route licenses given by department of transport
- Routes controlled by 63 mafias
- Nearly 30000 minibuses. Individual owner driven vehicles.
- Huge competition on the road for passengers (penny war)
- Poor efficiency. Nearly 650buses/hr/dir! Mostly half empty



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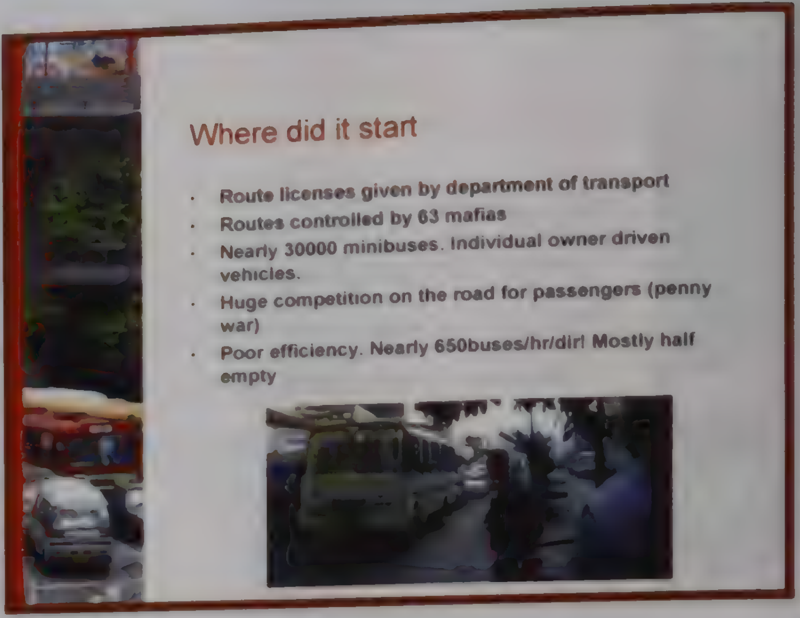

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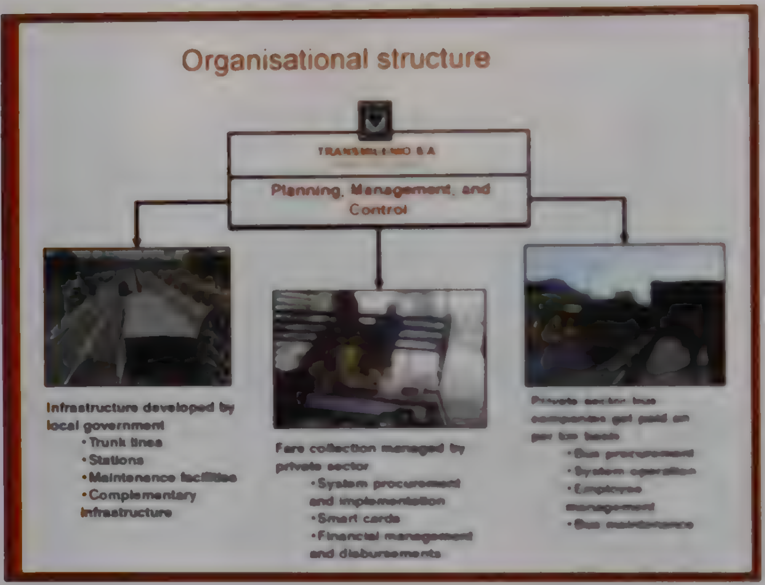


Organisational structure

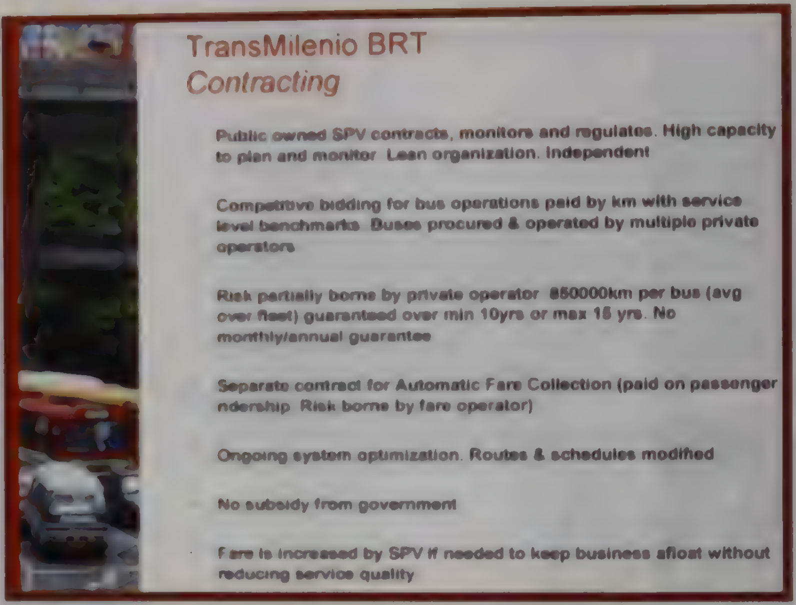
TRANSMILENIO S.A

Planning, Management, and Control

Infrastructure developed by local government
- Trunk lines
- Stations
- Maintenance facilities
- Complementary infrastructure

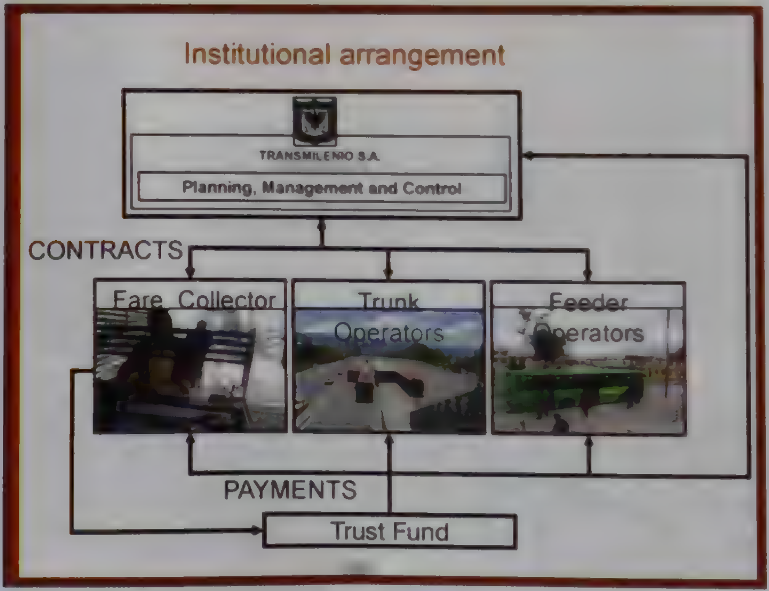
Fare collection managed by private sector
- System procurement and implementation
- Smart cards
- Financial management and disbursements

Private sector bus companies get paid on per km basis
- Bus procurement
- System operation
- Employee management
- Bus maintenance



TransMilenio BRT
Contracting

- Public owned SPV contracts, monitors and regulates. High capacity to plan and monitor. Lean organization. Independent
- Competitive bidding for bus operations paid by km with service level benchmarks. Buses procured & operated by multiple private operators
- Risk partially borne by private operator. 850000km per bus (avg over fleet) guaranteed over min 10yrs or max 15 yrs. No monthly/annual guarantee
- Separate contract for Automatic Fare Collection (paid on passenger ridership. Risk borne by fare operator)
- Ongoing system optimization. Routes & schedules modified
- No subsidy from government
- Fare is increased by SPV if needed to keep business afloat without reducing service quality



Institutional arrangement

TRANSMILENIO S.A.

Planning, Management and Control

CONTRACTS

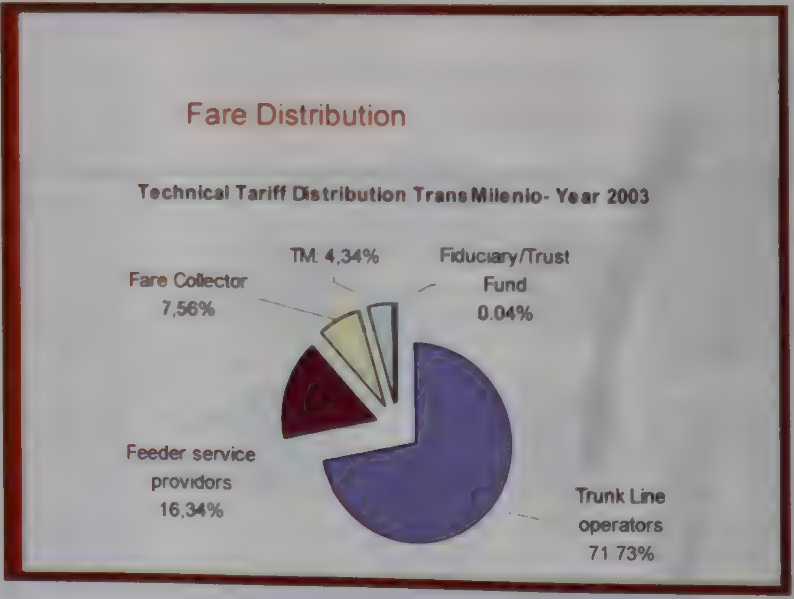
Fare Collector

Trunk Operators

Feeder Operators

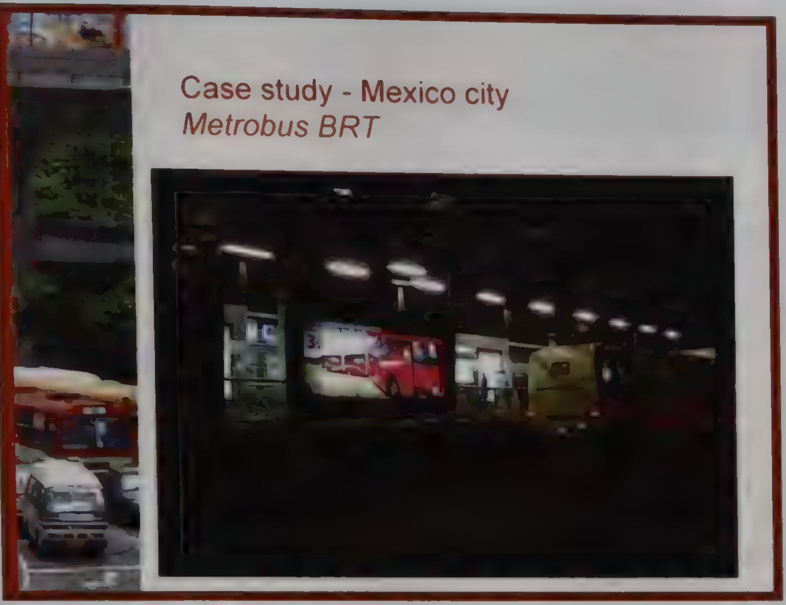
PAYMENTS

Trust Fund



Fare Distribution

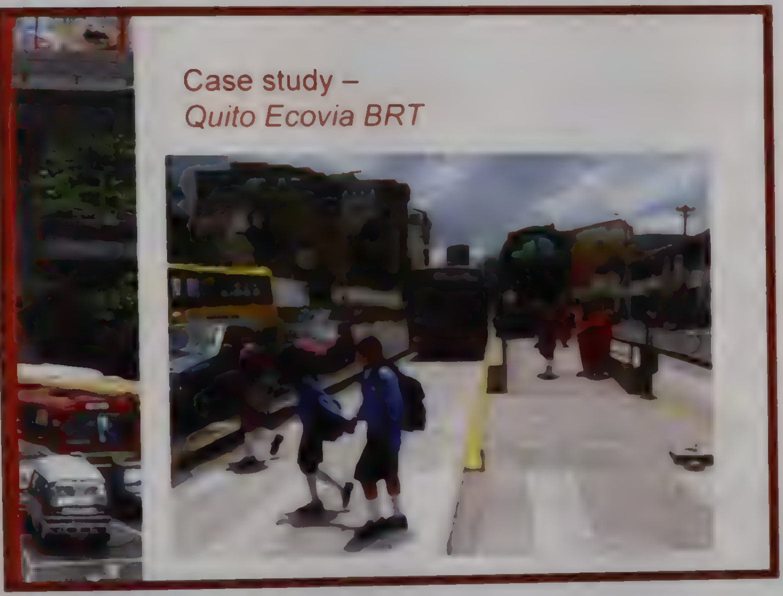
Technical Tariff Distribution TransMilenio- Year 2003



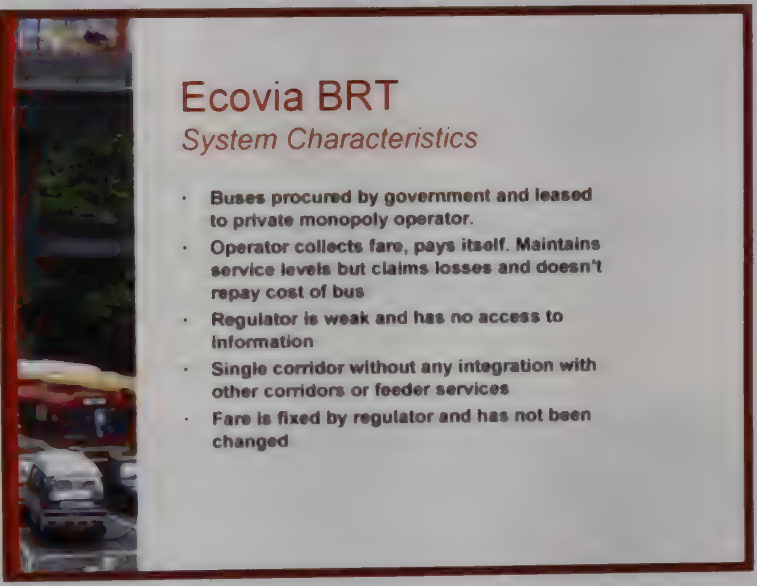
Case study - Mexico city
Metrobus BRT

Metrobus BRT
System Characteristics

- SPV formed but weak capacity in planning and monitoring
- Private monopoly operator awarded contract with no bidding. Some competition from a public bus operator.
- Poor negotiation, so price paid to operator per km is high. Resulted in high public fare.
- Buses procured by private monopoly operator
- Independent fare collection contract. Fare operator pays itself (based on ridership), monopoly bus operator (on km) and public sector bus operator (on km).
- Two corridors with poor integration between themselves, with feeder services and other services

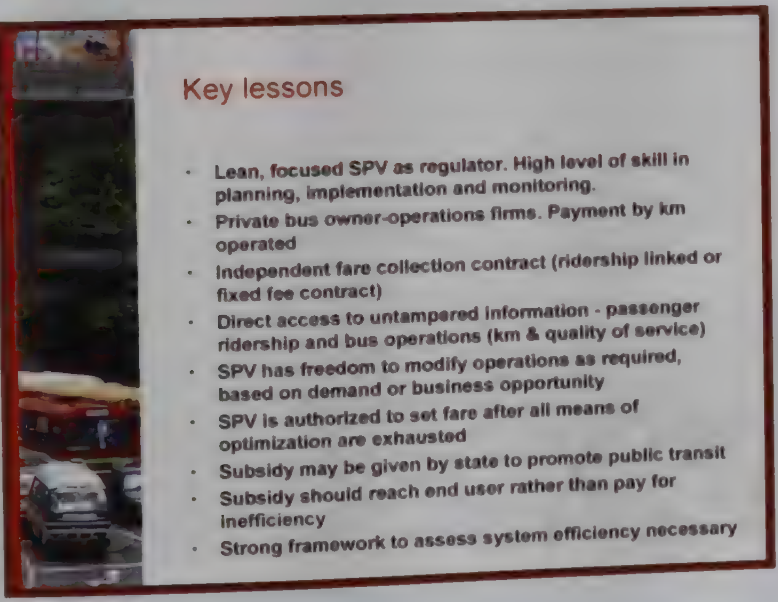


Case study –
Quito Ecovia BRT



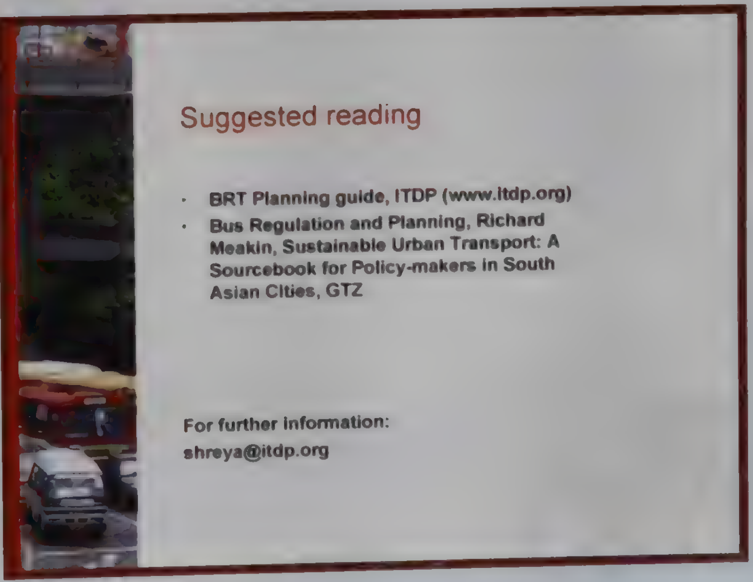
Ecovia BRT
System Characteristics

- Buses procured by government and leased to private monopoly operator.
- Operator collects fare, pays itself. Maintains service levels but claims losses and doesn't repay cost of bus
- Regulator is weak and has no access to information
- Single corridor without any integration with other corridors or feeder services
- Fare is fixed by regulator and has not been changed



Key lessons

- Lean, focused SPV as regulator. High level of skill in planning, implementation and monitoring.
- Private bus owner-operations firms. Payment by km operated
- Independent fare collection contract (ridership linked or fixed fee contract)
- Direct access to untampered information - passenger ridership and bus operations (km & quality of service)
- SPV has freedom to modify operations as required, based on demand or business opportunity
- SPV is authorized to set fare after all means of optimization are exhausted
- Subsidy may be given by state to promote public transit
- Subsidy should reach end user rather than pay for inefficiency
- Strong framework to assess system efficiency necessary



Suggested reading

- BRT Planning guide, ITDP (www.itdp.org)
- Bus Regulation and Planning, Richard Meakin, Sustainable Urban Transport: A Sourcebook for Policy-makers in South Asian Cities, GTZ

For further information:
shreya@itdp.org

Question and Answer:

Q. Who should implement the BRT system?

Ans. Since BMLTA is an umbrella organization which coordinates with the other interested transport groups, it would take the lead in supporting the BRT system.

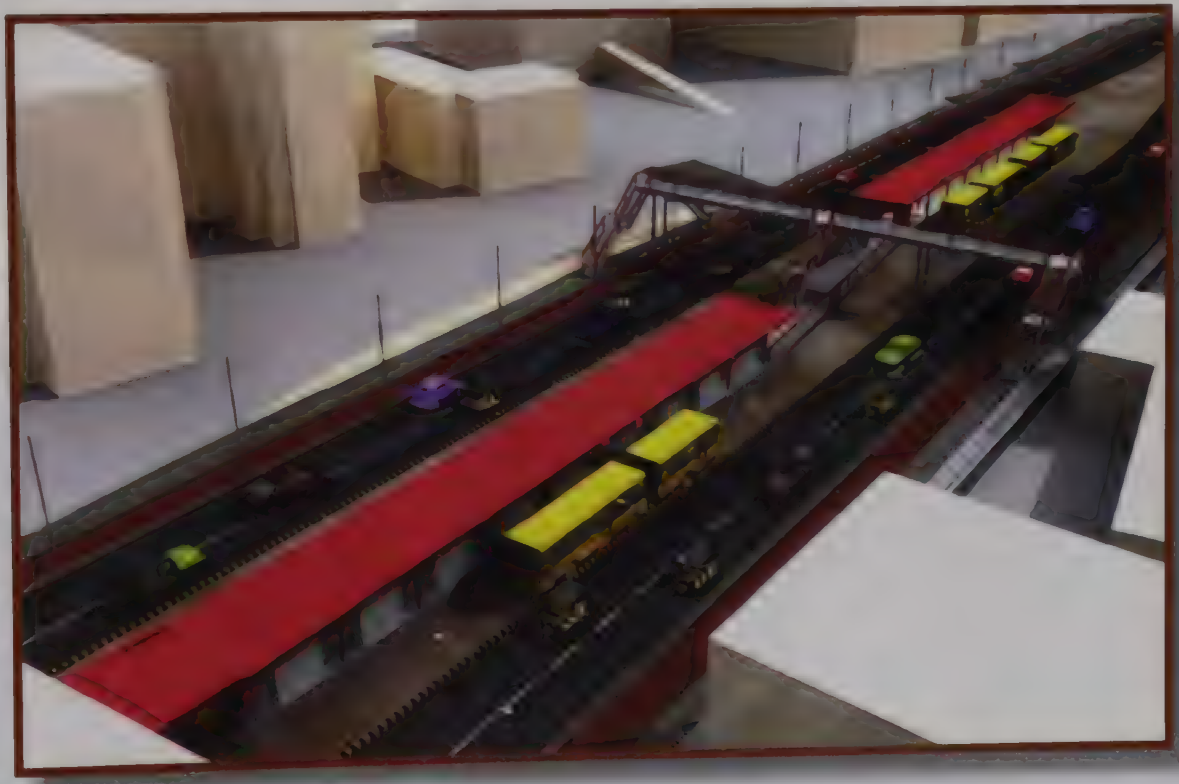
Q. Who should be the executing agency for the BRT operation? Should Municipal Corporation or a City Bus Operator should be the executing agency or a Separate entity/ SPV should be created in BRT operation?

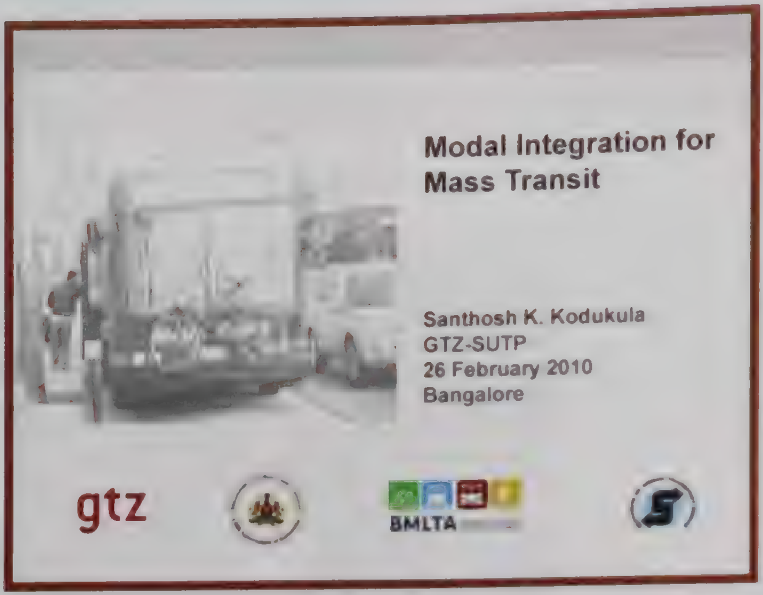
Ans. Every city will have its own peculiarity. It's that Integrated Approach that works. Different agencies should come together and do it. In case of Bogota Special Purpose Vehicle was created to handle bus operation as they didn't have a good bus agency. But in Bangalore there's a good bus agency. Creation of new bus agency is not required. SPV is required to run the system through the bus agency. The speaker also feels that the system should not replicate from other cities and needs to adapt to its own ground conditions.

Session 6: Modal Integration

In this presentation

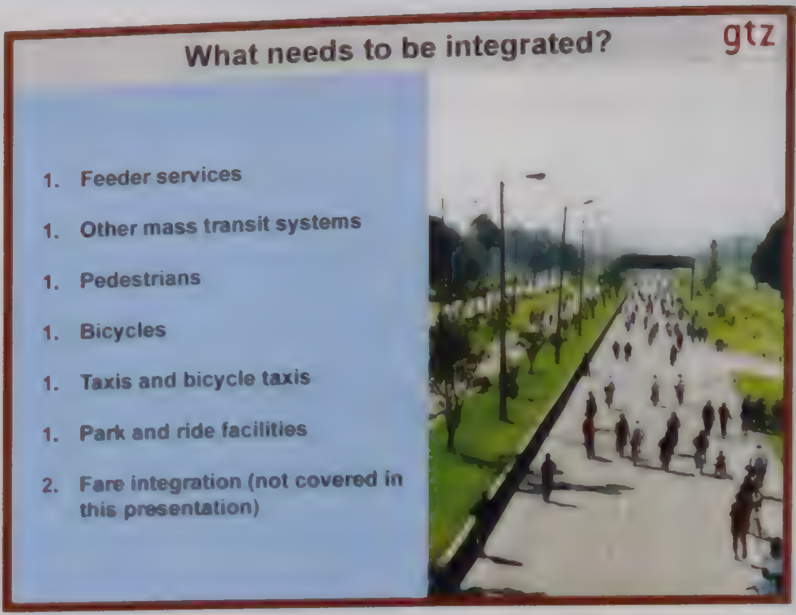
Mr. Santhosh Kodukula detailed the features which should be integrated in a BRT. This pictorial presentation clarifies the way to integrate the mode of choice (feeder services, accessibility to NMT, fare etc) into BRT. Some of his slides enlighten the need for proper planning and understanding the needs of people before designing the facilities. (For example, a bus station design in Bangkok, have gone wrong because of its improper placement and minor errors, which completely ruined the utility of the station)





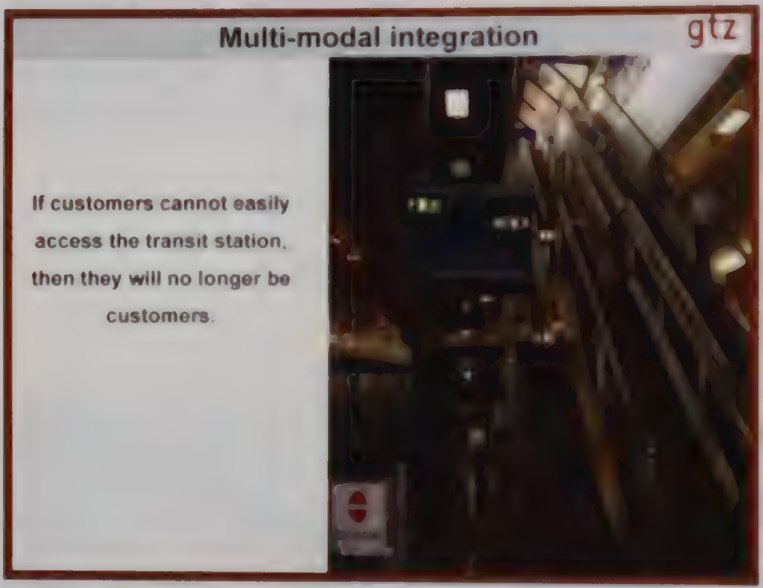
Modal Integration for Mass Transit

Santhosh K. Kodukula
GTZ-SUTP
26 February 2010
Bangalore



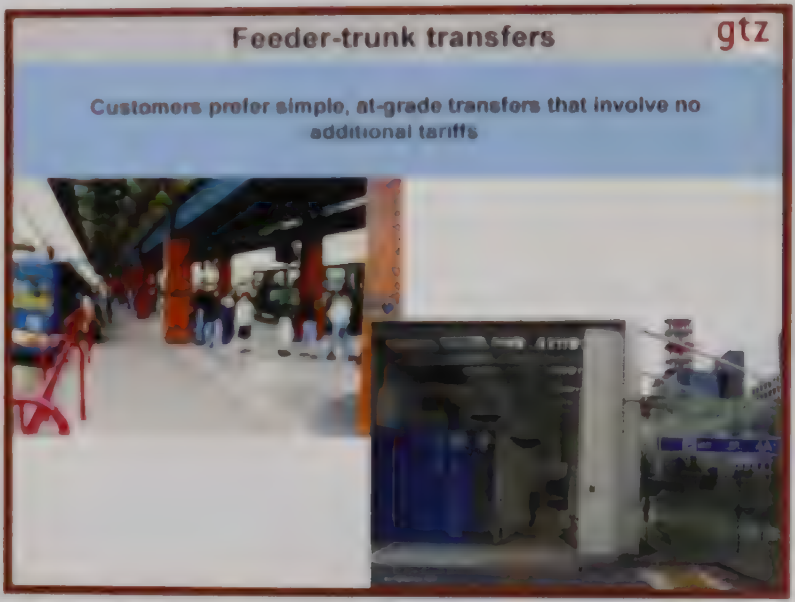
What needs to be integrated?

1. Feeder services
1. Other mass transit systems
1. Pedestrians
1. Bicycles
1. Taxis and bicycle taxis
1. Park and ride facilities
2. Fare integration (not covered in this presentation)



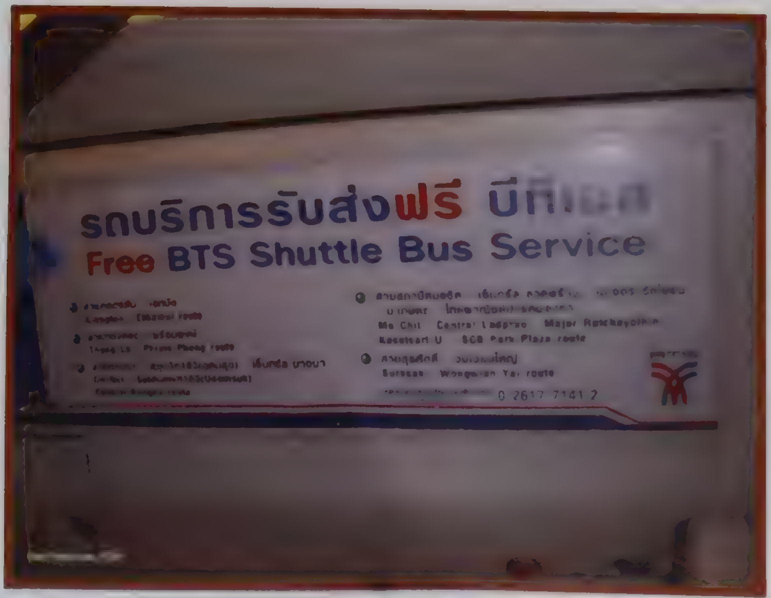
Multi-modal integration

If customers cannot easily access the transit station, then they will no longer be customers.

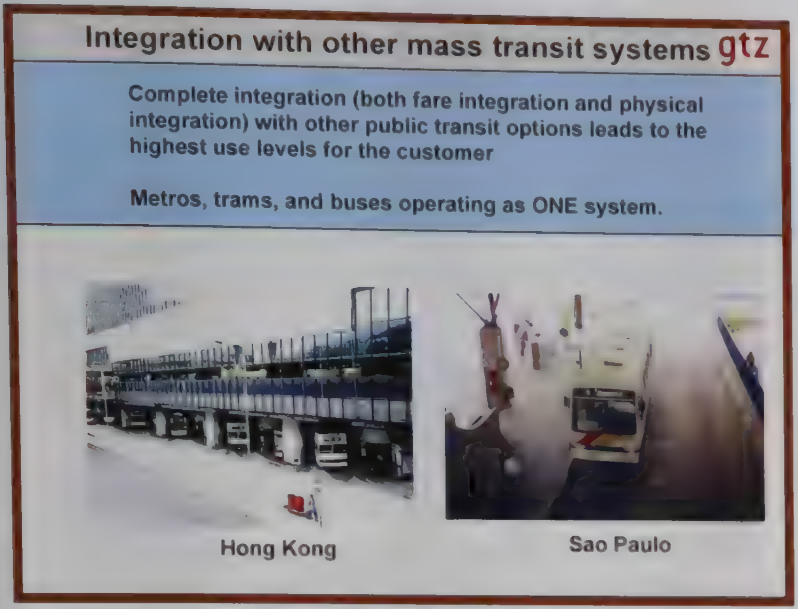


Feeder-trunk transfers

Customers prefer simple, at-grade transfers that involve no additional tariffs



รถบริการรับส่งฟรี บีทีเอส
Free BTS Shuttle Bus Service
Mo Chit Central Ladprao Major Ratchayothin
Kasetsart U SCB Park Plaza route
0 2617 7141 2



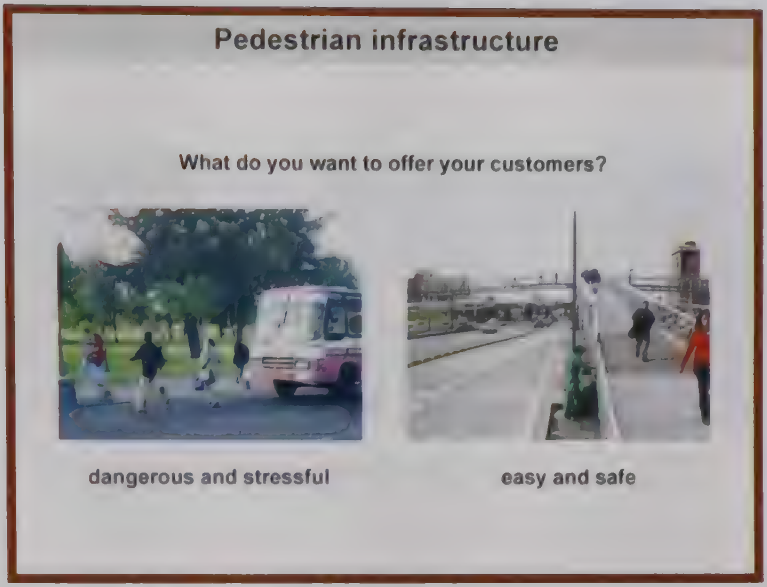
Integration with other mass transit systems

Complete integration (both fare integration and physical integration) with other public transit options leads to the highest use levels for the customer

Metros, trams, and buses operating as ONE system.

Hong Kong

Sao Paulo

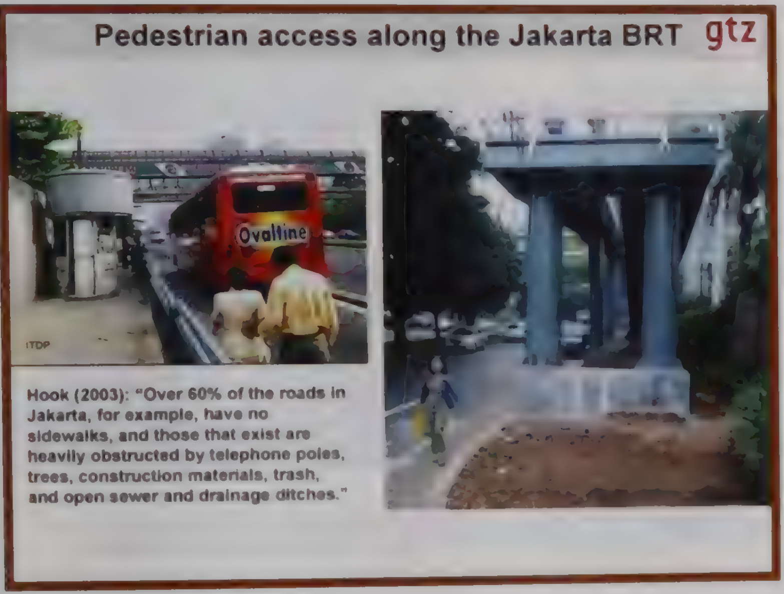


Pedestrian infrastructure

What do you want to offer your customers?

dangerous and stressful

easy and safe

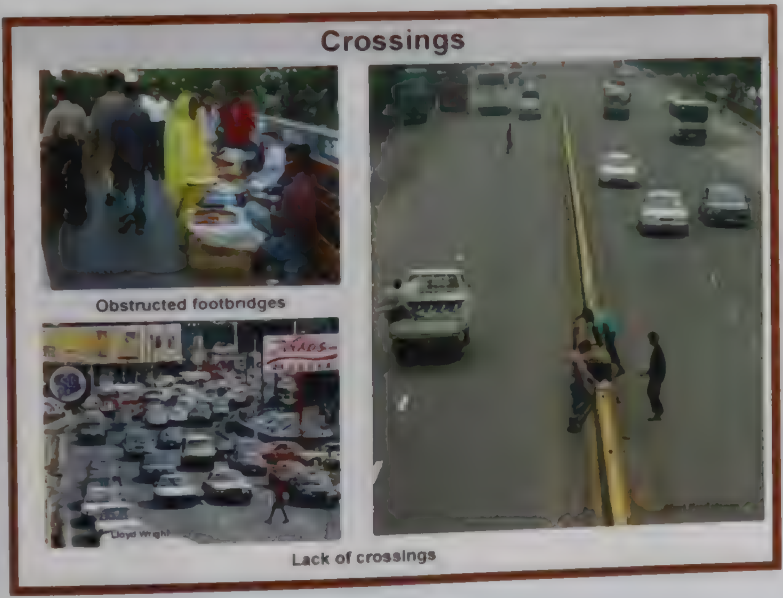


Pedestrian access along the Jakarta BRT

Ovaltine
ITDP

Hook (2003): "Over 60% of the roads in Jakarta, for example, have no sidewalks, and those that exist are heavily obstructed by telephone poles, trees, construction materials, trash, and open sewer and drainage ditches."

Developing-city footpaths



Crossings

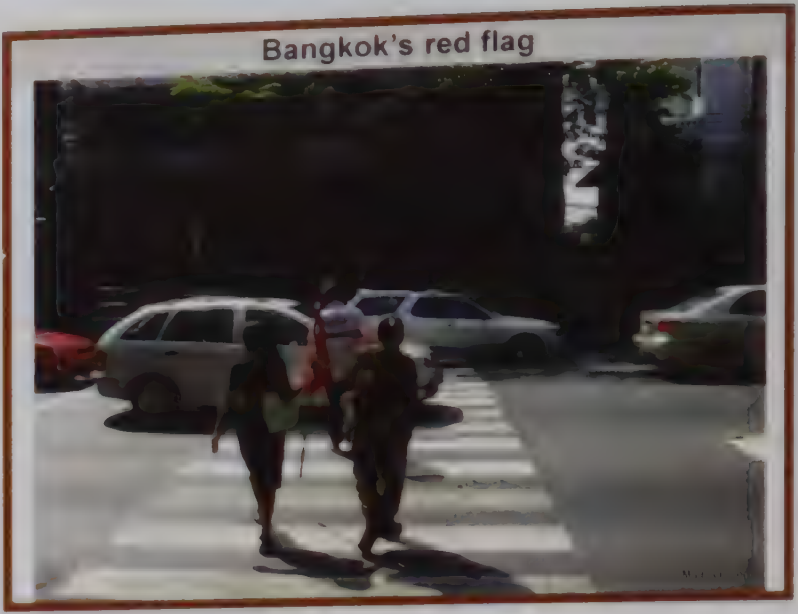
Obstructed footbridges

Lack of crossings

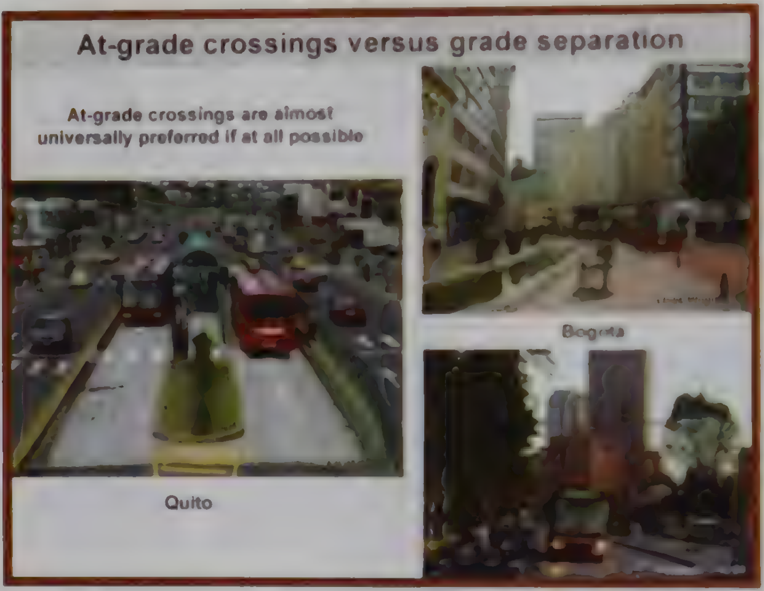
Footpath planning and control

Enforcement

Vehicle parking on footpaths



Bangkok's red flag

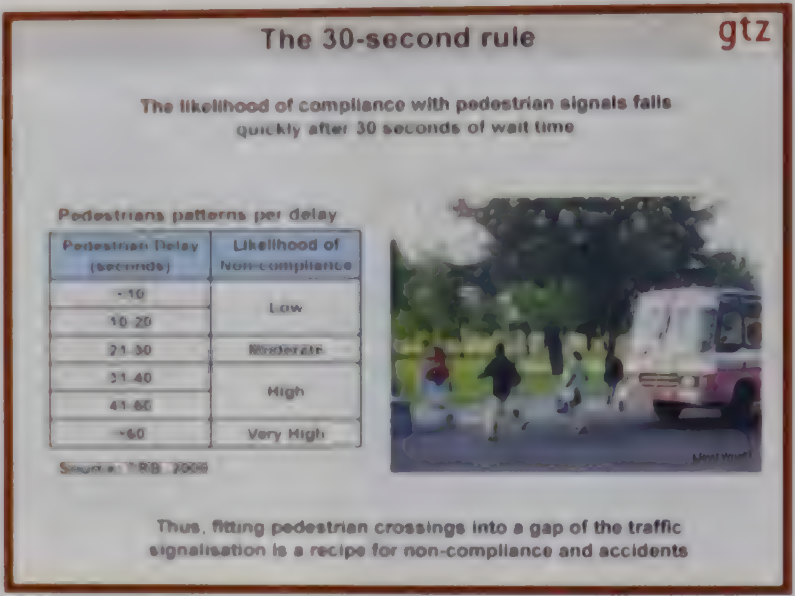


At-grade crossings versus grade separation

At-grade crossings are almost universally preferred if at all possible

Quito

Bogota



The 30-second rule

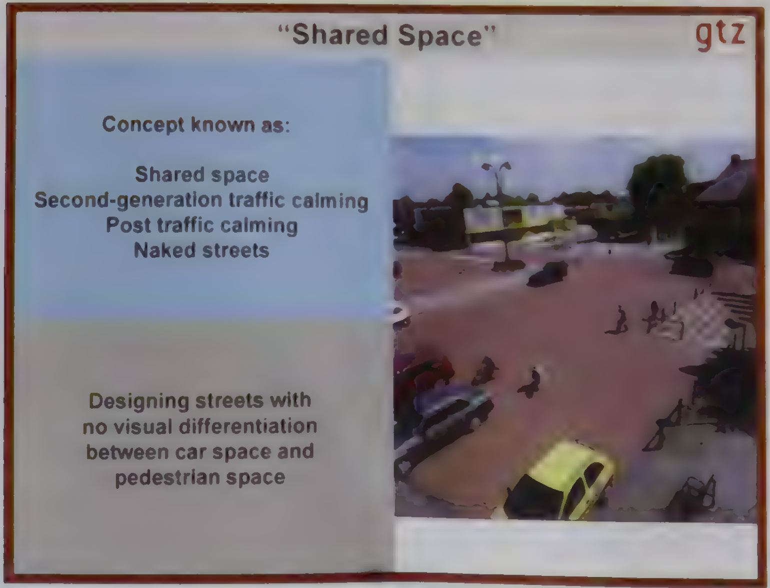
The likelihood of compliance with pedestrian signals falls quickly after 30 seconds of wait time

Pedestrians patterns per delay

Pedestrian Delay (seconds)	Likelihood of Non-compliance
<10	Low
10-20	
21-30	Moderate
31-40	High
41-60	
>60	Very High

Source: TRB, 2000

Thus, fitting pedestrian crossings into a gap of the traffic signalisation is a recipe for non-compliance and accidents



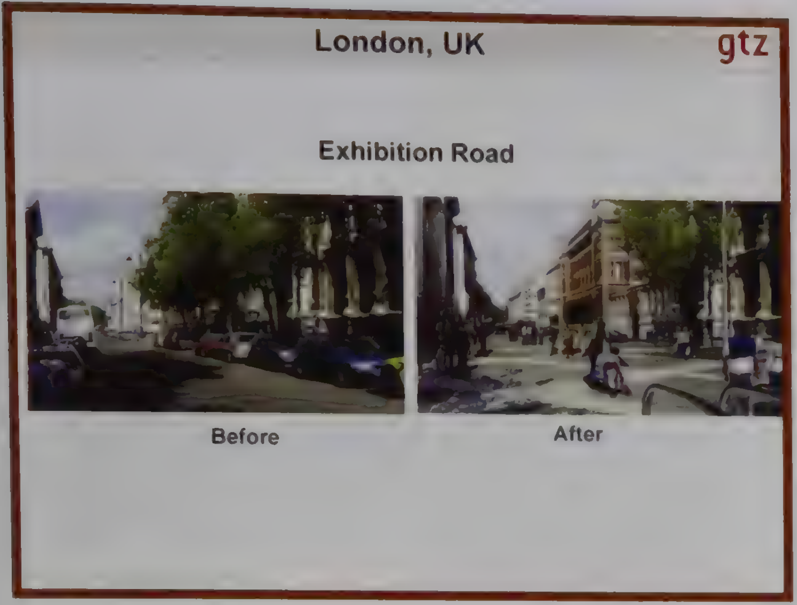
"Shared Space"

Concept known as:

Shared space
Second-generation traffic calming
Post traffic calming
Naked streets

Designing streets with no visual differentiation between car space and pedestrian space

"Shared Space" in Biel, Switzerland

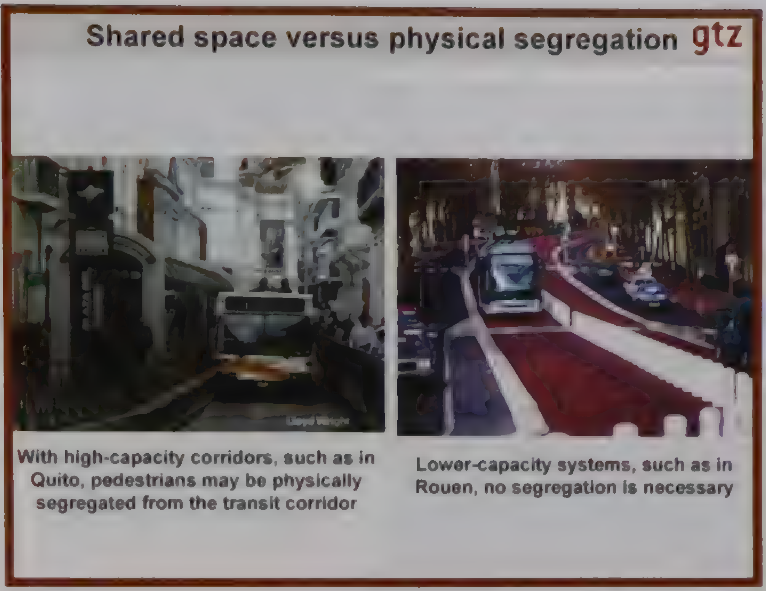


London, UK

Exhibition Road

Before

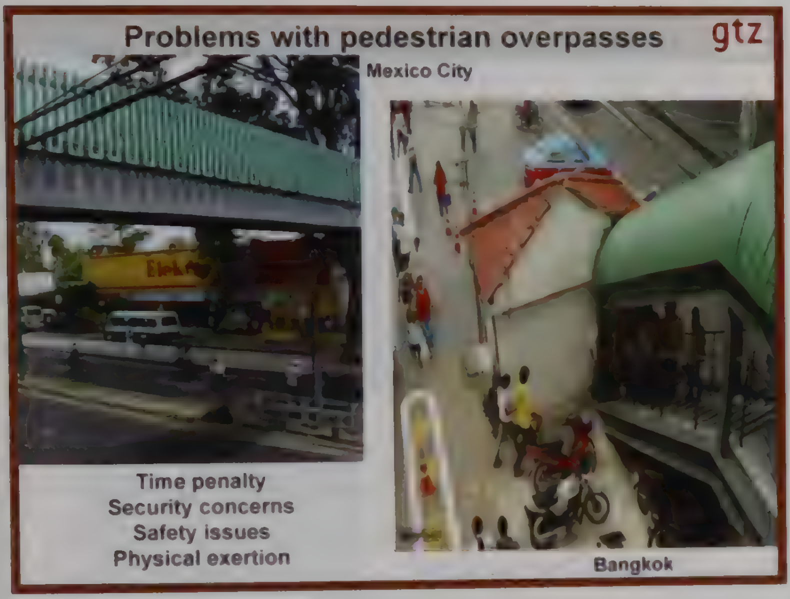
After



Shared space versus physical segregation

With high-capacity corridors, such as in Quito, pedestrians may be physically segregated from the transit corridor

Lower-capacity systems, such as in Rouen, no segregation is necessary

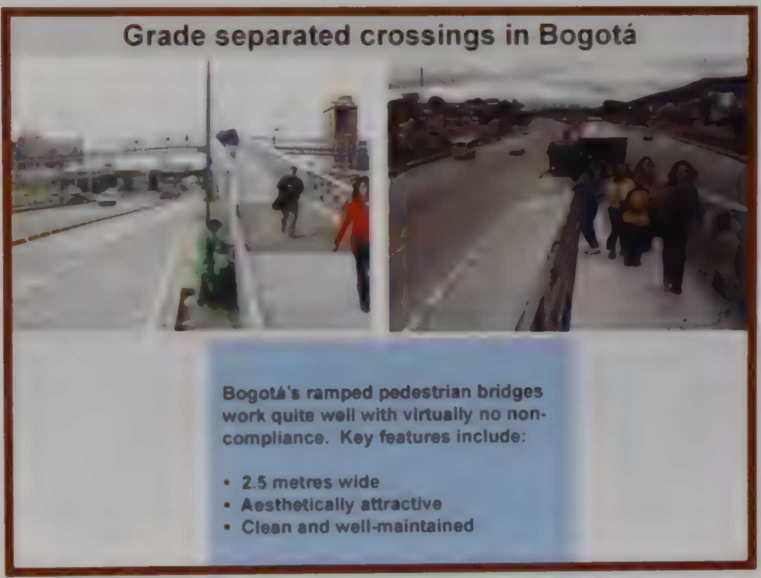


Problems with pedestrian overpasses

Mexico City

- Time penalty
- Security concerns
- Safety issues
- Physical exertion

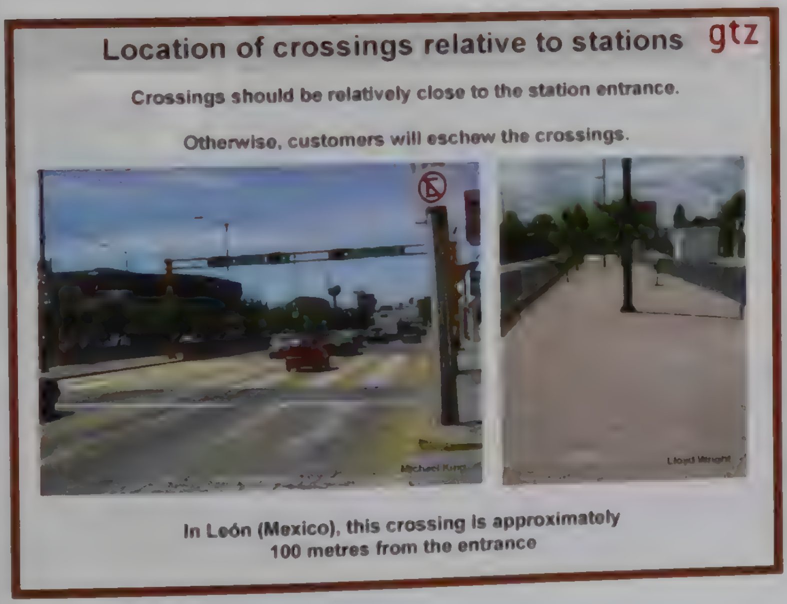
Bangkok



Grade separated crossings in Bogotá

Bogotá's ramped pedestrian bridges work quite well with virtually no non-compliance. Key features include:

- 2.5 metres wide
- Aesthetically attractive
- Clean and well-maintained

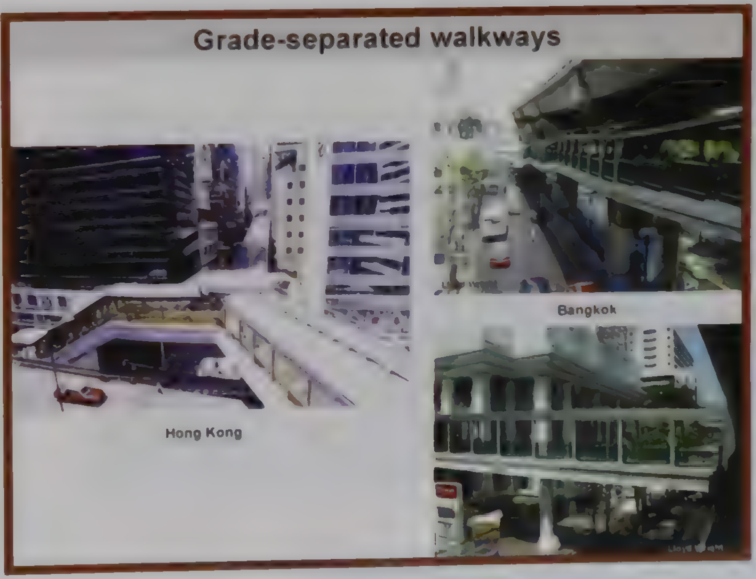


Location of crossings relative to stations

Crossings should be relatively close to the station entrance.

Otherwise, customers will eschew the crossings.

In León (Mexico), this crossing is approximately 100 metres from the entrance



Grade-separated walkways

Hong Kong

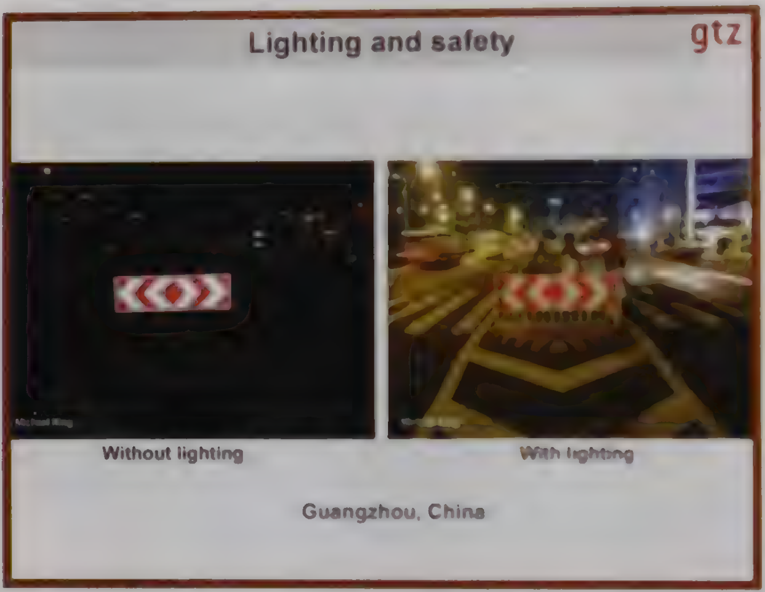
Bangkok

Covered walkways

Transit and pedestrian zones

Mass transit alleviates traffic to create pedestrian space

And pedestrian zones generate customers for transit

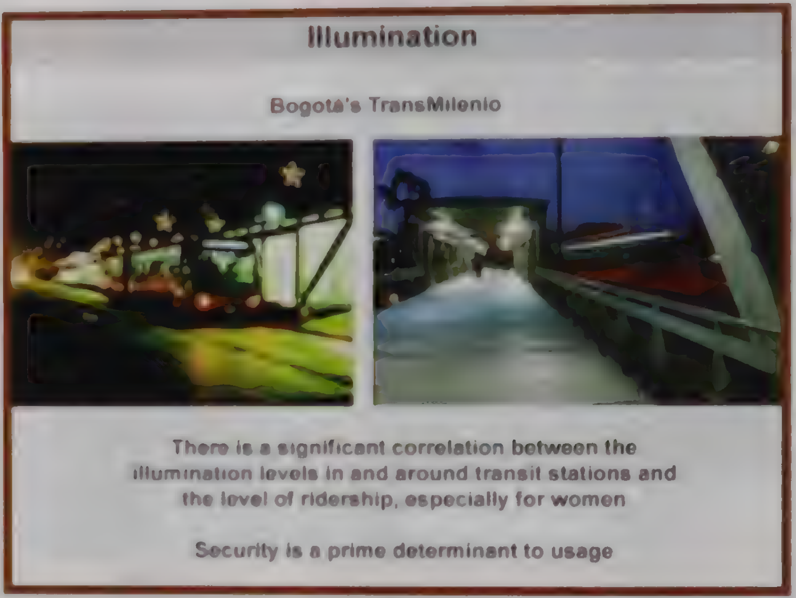


Lighting and safety

Without lighting

With lighting

Guangzhou, China



Illumination

Bogotá's TransMilenio

There is a significant correlation between the illumination levels in and around transit stations and the level of ridership, especially for women

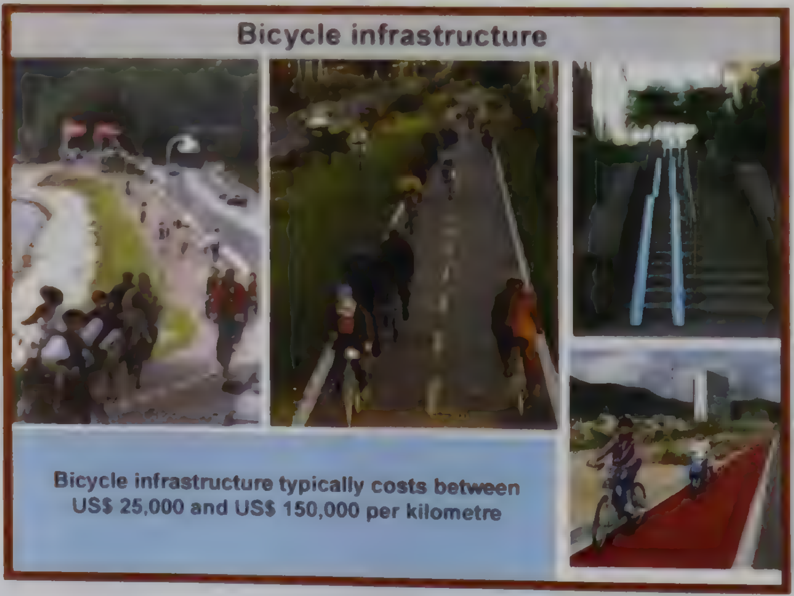
Security is a prime determinant to usage

Bicycles and transit vehicles

Rear space for bicycles; Rouen, France

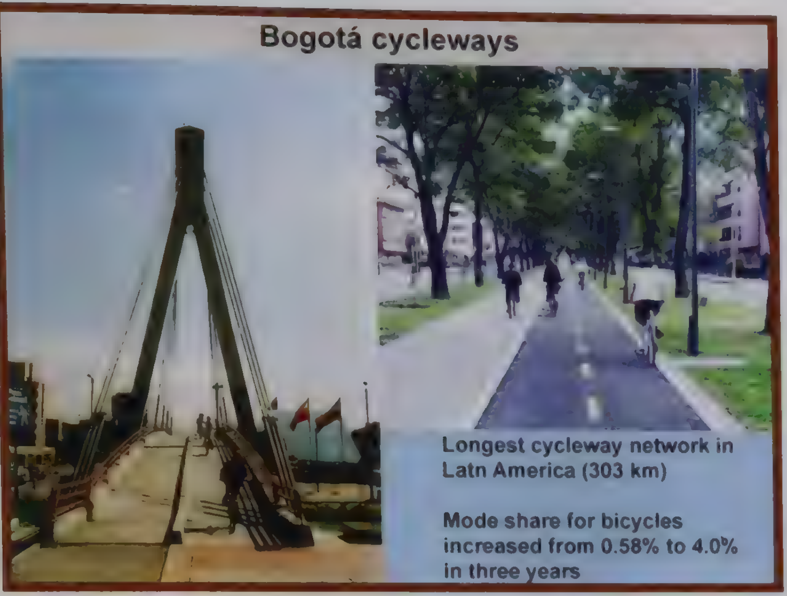
Copenhagen metro

Bangkok MRT



Bicycle infrastructure

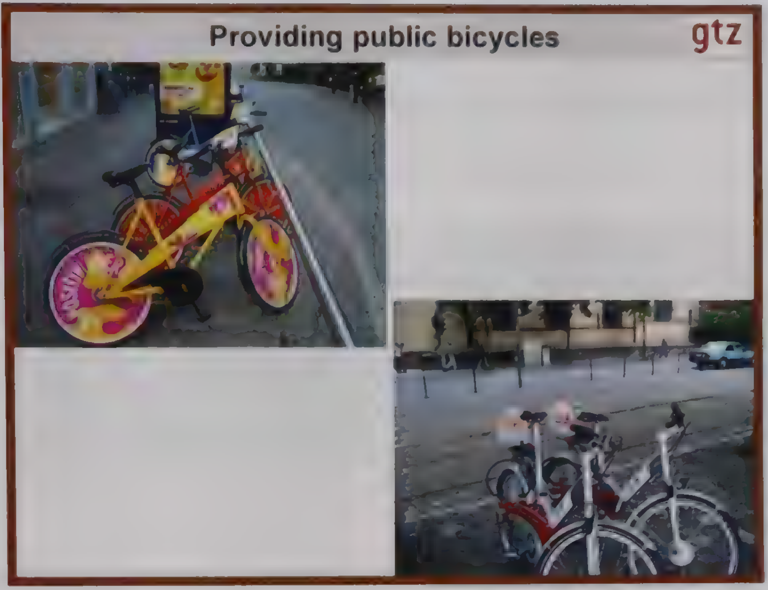
Bicycle infrastructure typically costs between US$ 25,000 and US$ 150,000 per kilometre



Bogotá cycleways

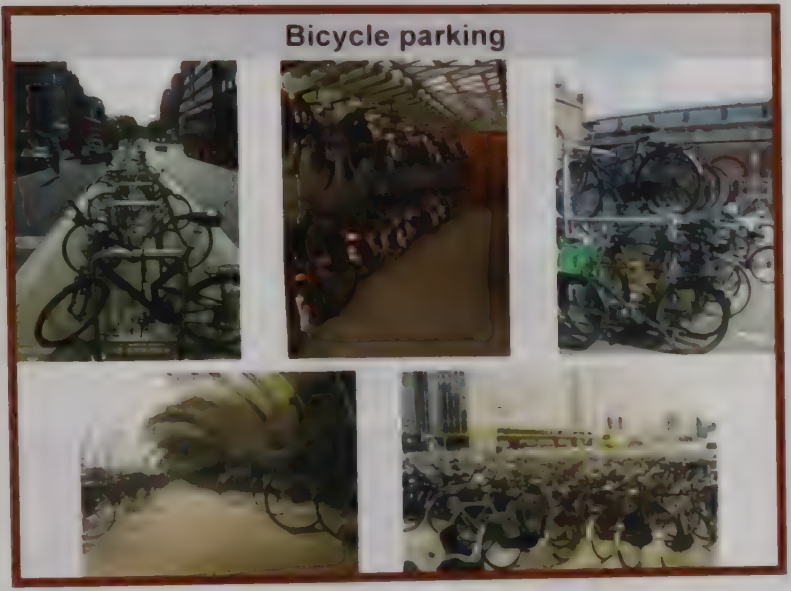
Longest cycleway network in Latn America (303 km)

Mode share for bicycles increased from 0.58% to 4.0% in three years

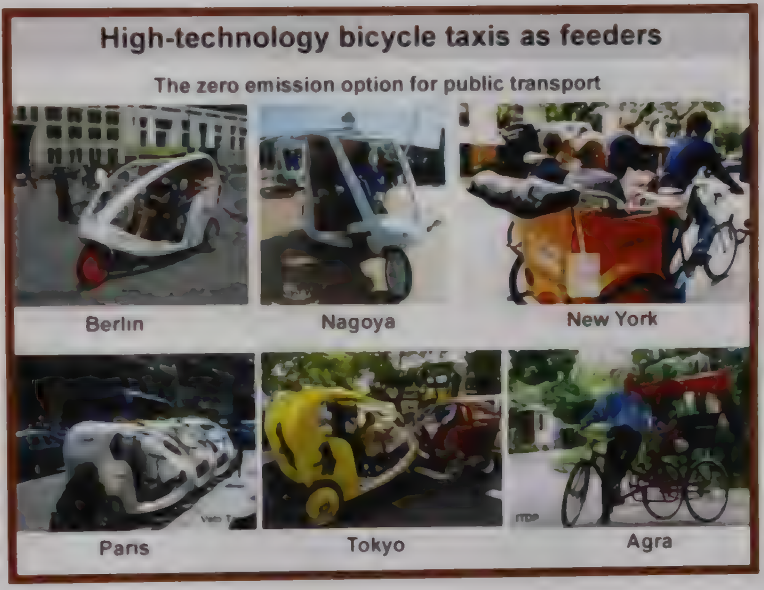


Providing public bicycles

gtz



Bicycle parking

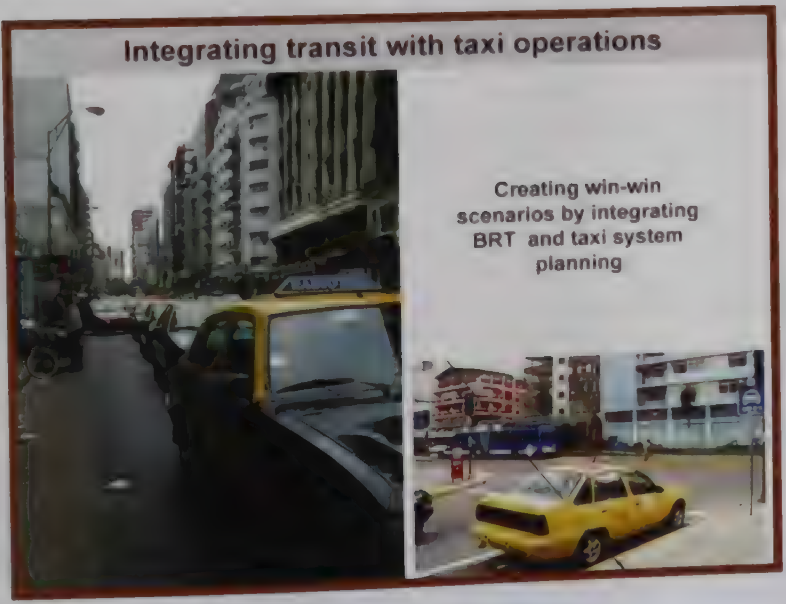


High-technology bicycle taxis as feeders

The zero emission option for public transport

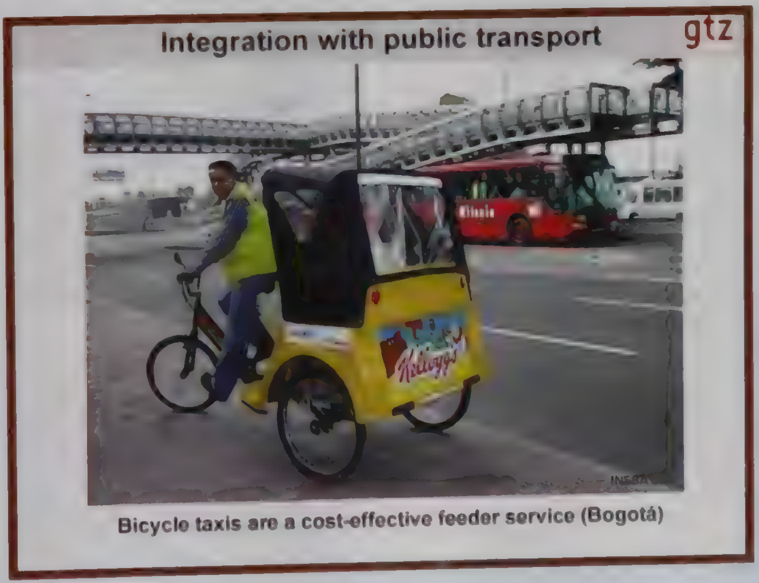
Berlin | Nagoya | New York

Paris | Tokyo | Agra



Integrating transit with taxi operations

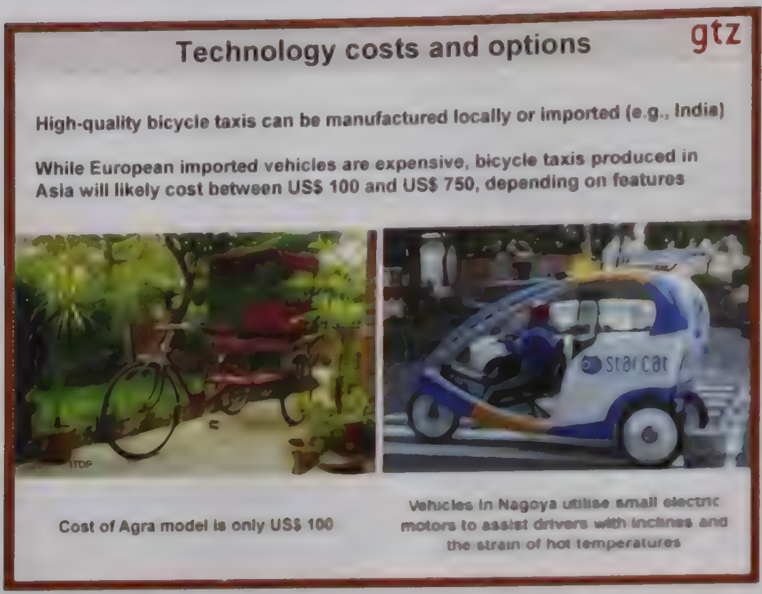
Creating win-win scenarios by integrating BRT and taxi system planning



Integration with public transport

gtz

Bicycle taxis are a cost-effective feeder service (Bogotá)



Technology costs and options

High-quality bicycle taxis can be manufactured locally or imported (e.g., India)

While European imported vehicles are expensive, bicycle taxis produced in Asia will likely cost between US$ 100 and US$ 750, depending on features

Cost of Agra model is only US$ 100

Vehicles in Nagoya utilise small electric motors to assist drivers with inclines and the strain of hot temperatures

Berlin

Paris

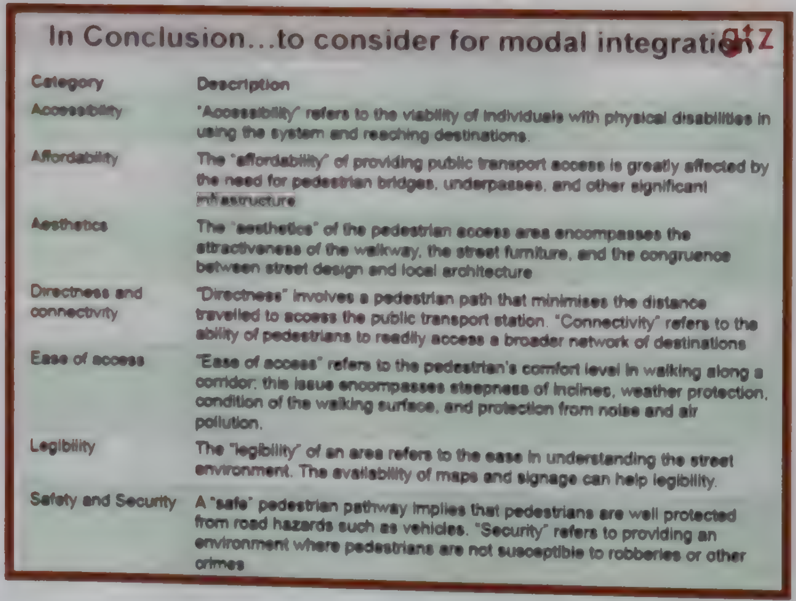
Japan

Park & ride facilities

Important to locate park & ride facilities near to residential trip origins

Commuters will not travel most of the way into the city and then enter a park & ride facility

Feasibility of park & ride depends on land availability



In Conclusion...to consider for modal integration

Category	Description
Accessibility	"Accessibility" refers to the viability of individuals with physical disabilities in using the system and reaching destinations.
Affordability	The "affordability" of providing public transport access is greatly affected by the need for pedestrian bridges, underpasses, and other significant infrastructure
Aesthetics	The "aesthetics" of the pedestrian access area encompasses the attractiveness of the walkway, the street furniture, and the congruence between street design and local architecture
Directness and connectivity	"Directness" involves a pedestrian path that minimises the distance travelled to access the public transport station. "Connectivity" refers to the ability of pedestrians to readily access a broader network of destinations
Ease of access	"Ease of access" refers to the pedestrian's comfort level in walking along a corridor; this issue encompasses steepness of inclines, weather protection, condition of the walking surface, and protection from noise and air pollution.
Legibility	The "legibility" of an area refers to the ease in understanding the street environment. The availability of maps and signage can help legibility.
Safety and Security	A "safe" pedestrian pathway implies that pedestrians are well protected from road hazards such as vehicles. "Security" refers to providing an environment where pedestrians are not susceptible to robberies or other crimes

Question and Answer:

Q. How BRT can be implemented in presence of Metro?

Ans. These are two different mass transit systems which cater for the public transport demand. The implementation of any transit system demands the understanding of local conditions to configure for the needs of people. However they differ in their features and components like in terms of their capacity and level of services etc.

Q. Should BRT act as a feeder system or as a self viable transit system?

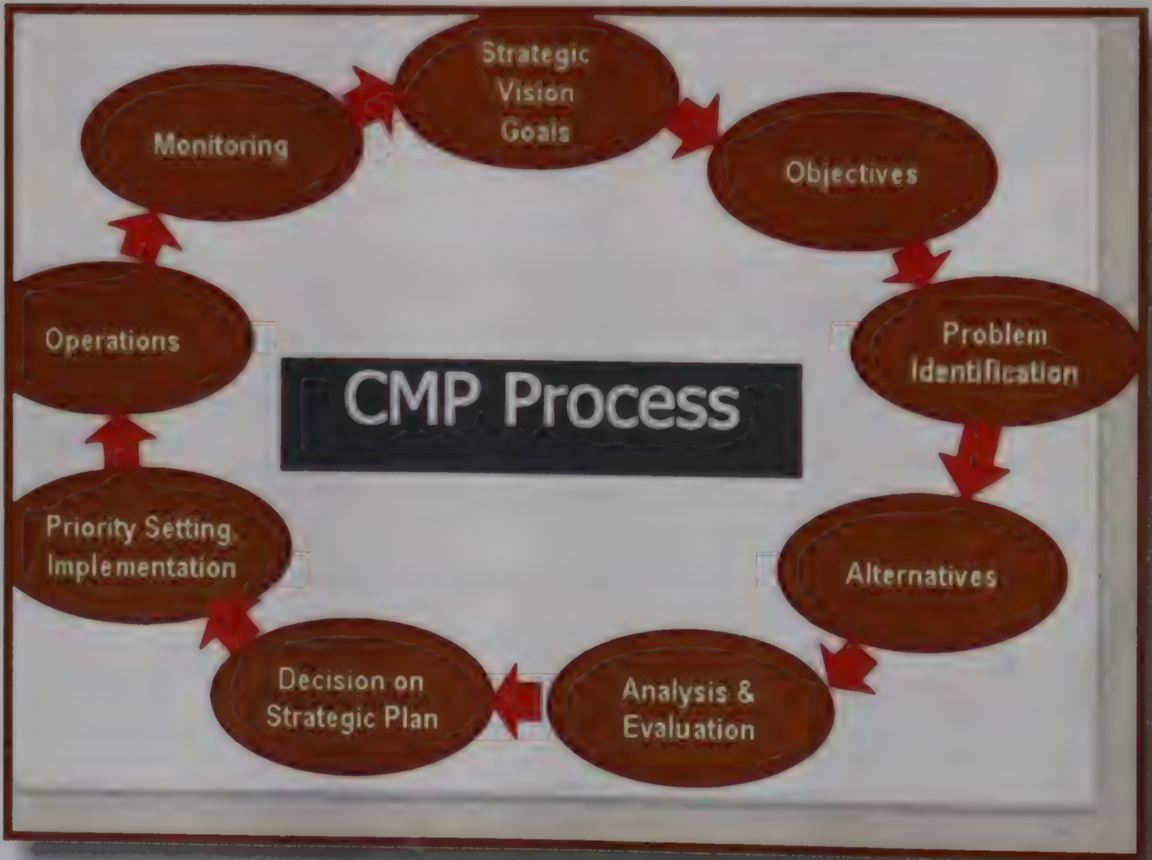
Ans. A full scale BRT system itself is a viable transit system. But, if there is a possibility of integration it with other higher capacity transit systems like Metro etc. then in principle, it shall act as a feeder system and can penetrate into many parts of the city's network.

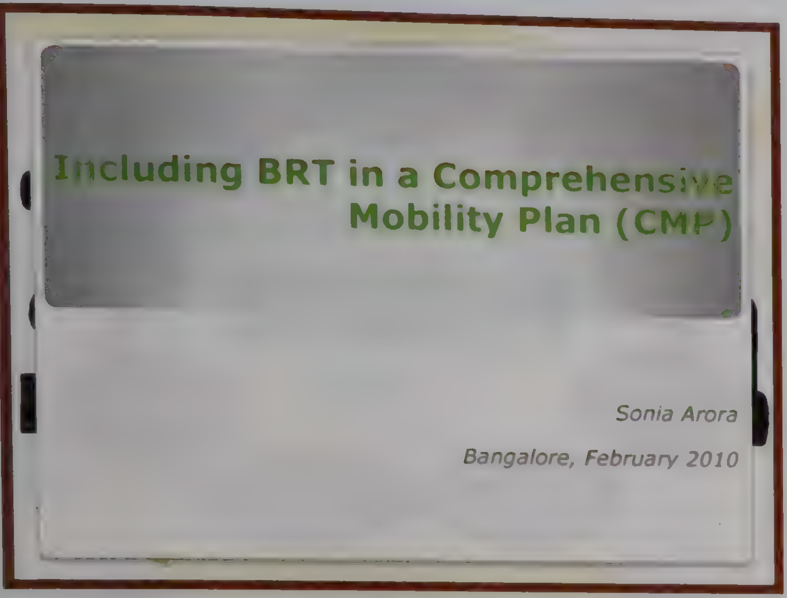
Q. What are the different areas that need integration with BRT?

Ans.BRT should be integrated to feeder services, other mass transit systems, NMT and its facilities, park and ride facilities & IPT; Apart from the mentioned, they also need to be integrated with the fare and integrated by institutions

Session 7: Including BRT in a comprehensive Mobility Plan

Ms. Sonia Kapoor, discussed about the process of conducting the comprehensive mobility studies (CMP). She explained the focusing areas of CMP (to improve public transport (PT) & NMT, promotion of NUTP strategies, urban transport integration, needs of mobility of people & freight) and discussed the advantages of conducting the study. She explained the five key tasks of CMP i.e., identification of scope, data collection and analysis, preparation and evaluation of urban transport development strategy, development of urban mobility plan and preparation of mobility program.

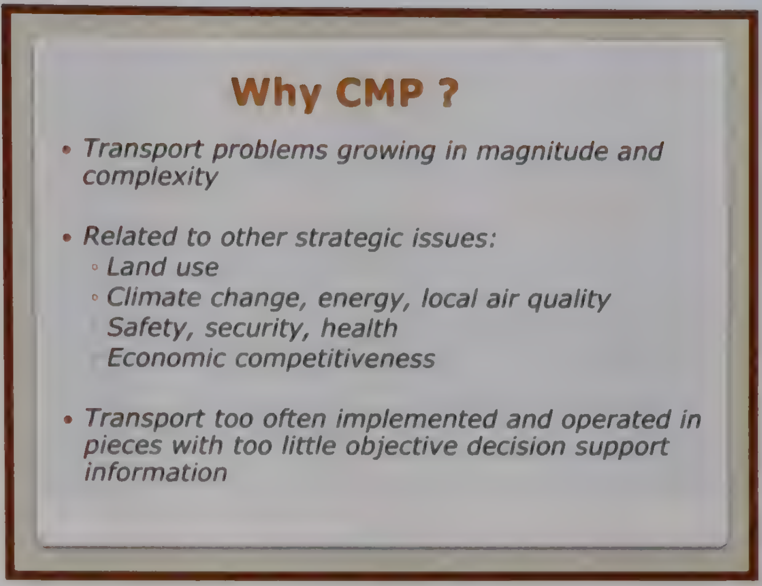




Including BRT in a Comprehensive Mobility Plan (CMP)

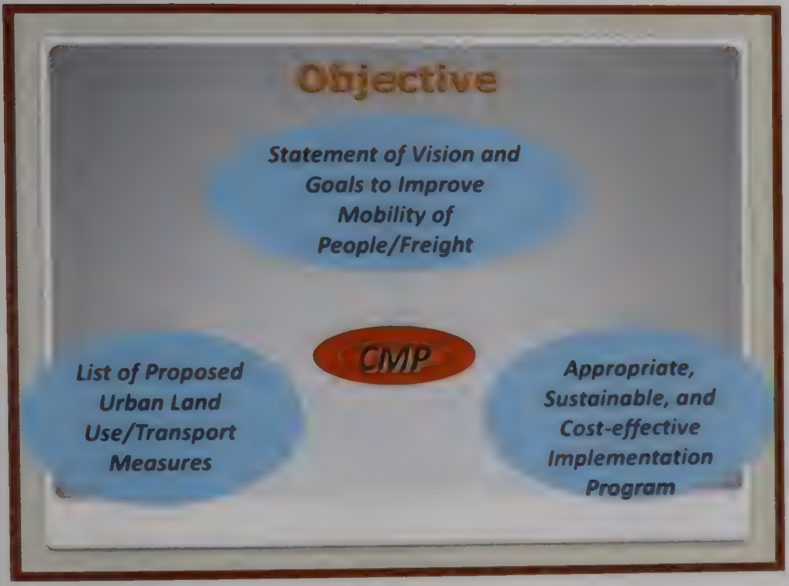
Sonia Arora

Bangalore, February 2010



Why CMP ?

- Transport problems growing in magnitude and complexity
- Related to other strategic issues:
  - Land use
  - Climate change, energy, local air quality
  - Safety, security, health
  - Economic competitiveness
- Transport too often implemented and operated in pieces with too little objective decision support information



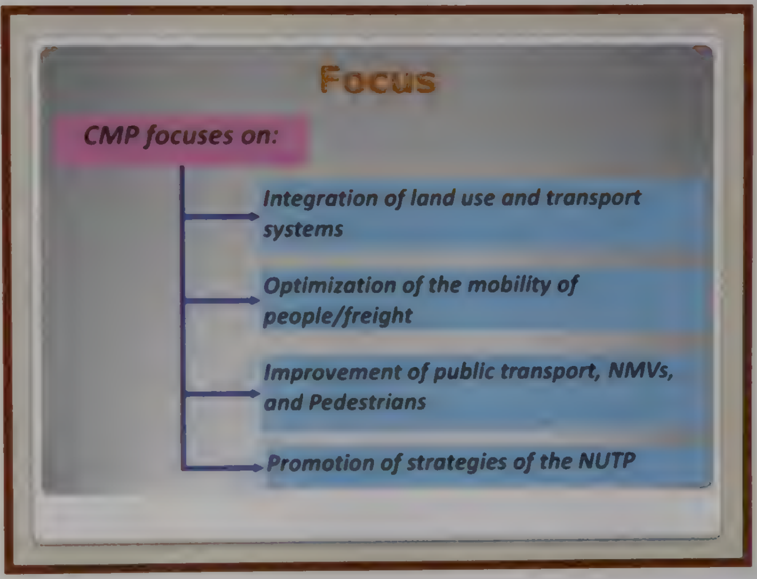
Objective

Statement of Vision and Goals to Improve Mobility of People/Freight

CMP

List of Proposed Urban Land Use/Transport Measures

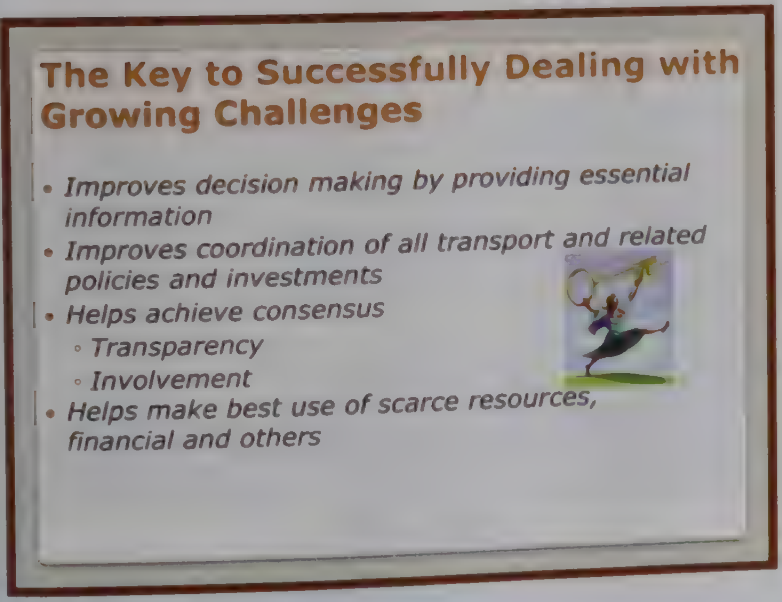
Appropriate, Sustainable, and Cost-effective Implementation Program



Focus

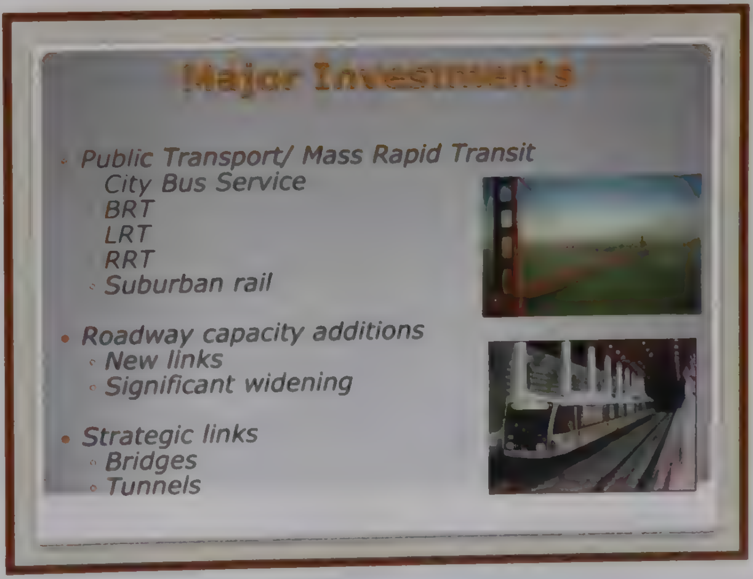
CMP focuses on:

- Integration of land use and transport systems
- Optimization of the mobility of people/freight
- Improvement of public transport, NMVs, and Pedestrians
- Promotion of strategies of the NUTP



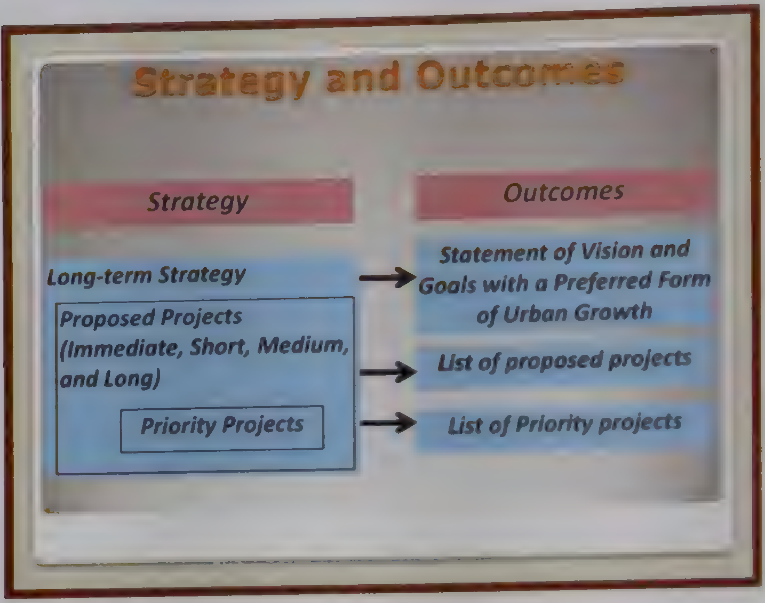
The Key to Successfully Dealing with Growing Challenges

- Improves decision making by providing essential information
- Improves coordination of all transport and related policies and investments
- Helps achieve consensus
  - Transparency
  - Involvement
- Helps make best use of scarce resources, financial and others



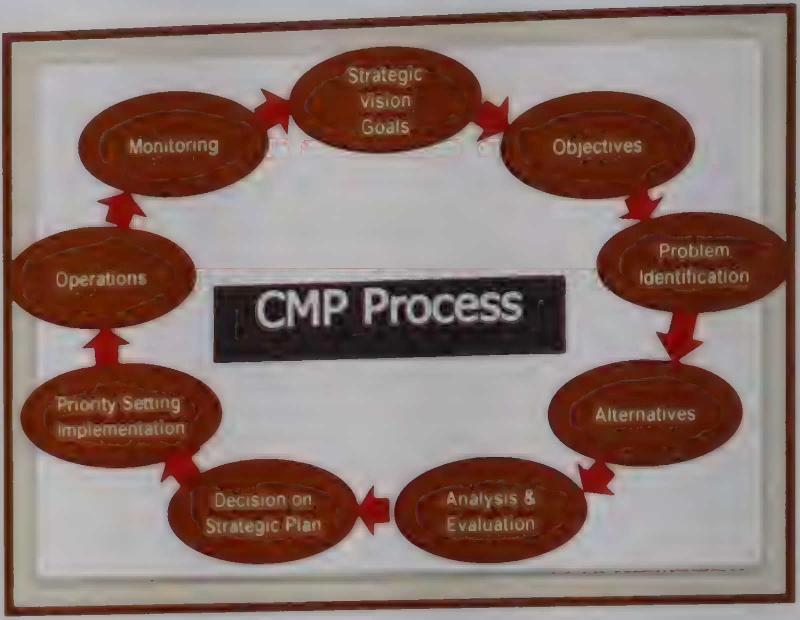
Major Investments

- Public Transport/ Mass Rapid Transit
  - City Bus Service
  - BRT
  - LRT
  - RRT
  - Suburban rail
- Roadway capacity additions
  - New links
  - Significant widening
- Strategic links
  - Bridges
  - Tunnels



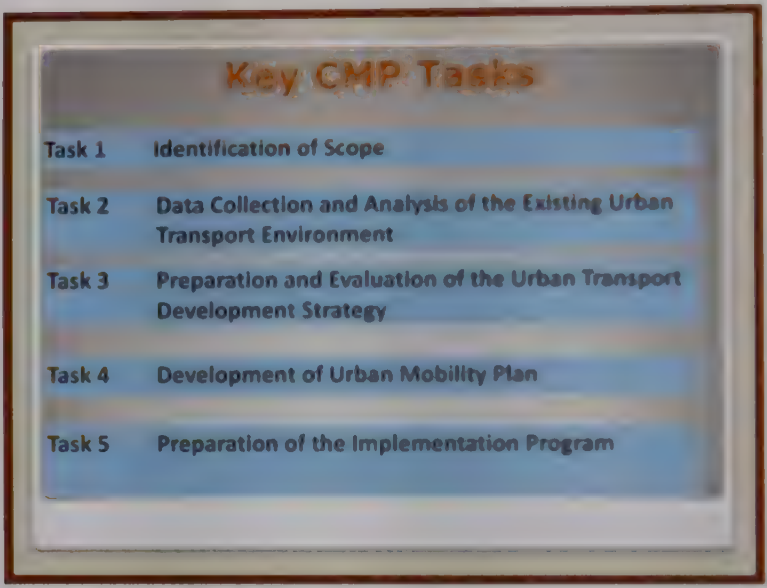
Strategy and Outcomes

Strategy	Outcomes
Long-term Strategy	Statement of Vision and Goals with a Preferred Form of Urban Growth
Proposed Projects (Immediate, Short, Medium, and Long)	List of proposed projects
Priority Projects	List of Priority projects



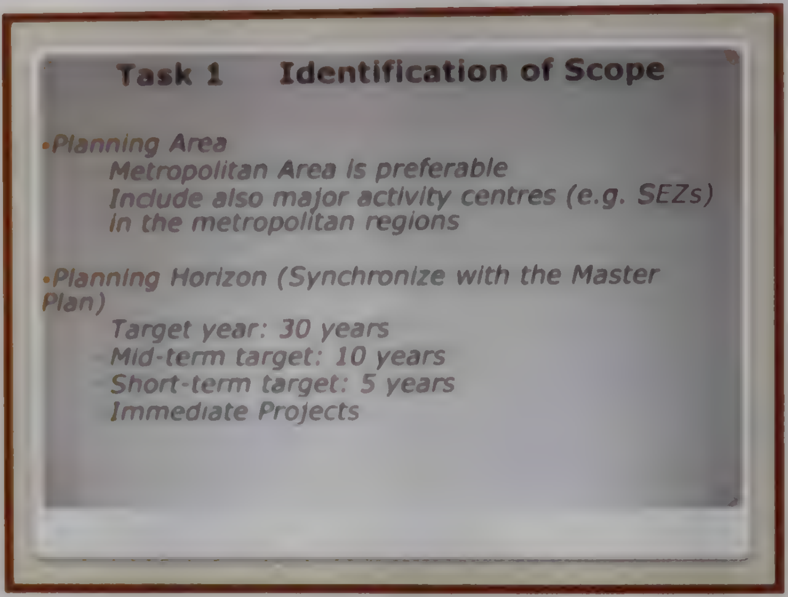
CMP Process

Strategic vision Goals
Objectives
Problem Identification
Alternatives
Analysis & Evaluation
Decision on Strategic Plan
Priority Setting Implementation
Operations
Monitoring



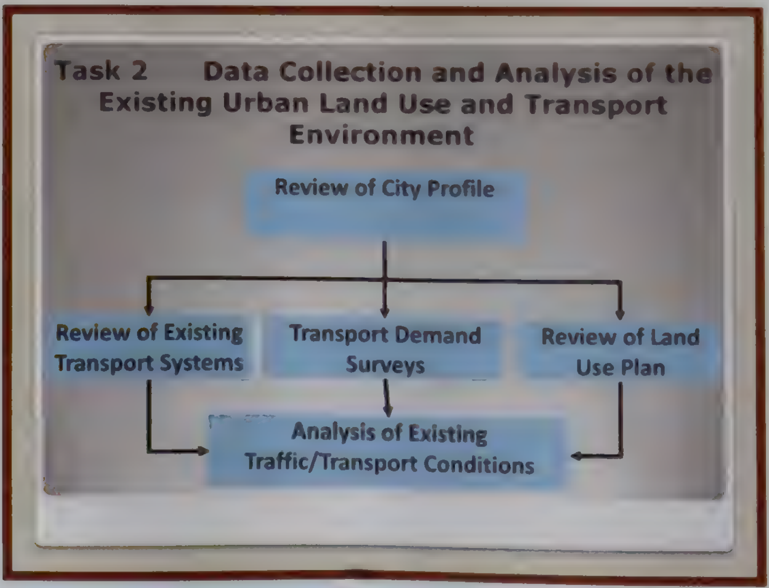
Key CMP Tasks

Task 1	Identification of Scope
Task 2	Data Collection and Analysis of the Existing Urban Transport Environment
Task 3	Preparation and Evaluation of the Urban Transport Development Strategy
Task 4	Development of Urban Mobility Plan
Task 5	Preparation of the Implementation Program



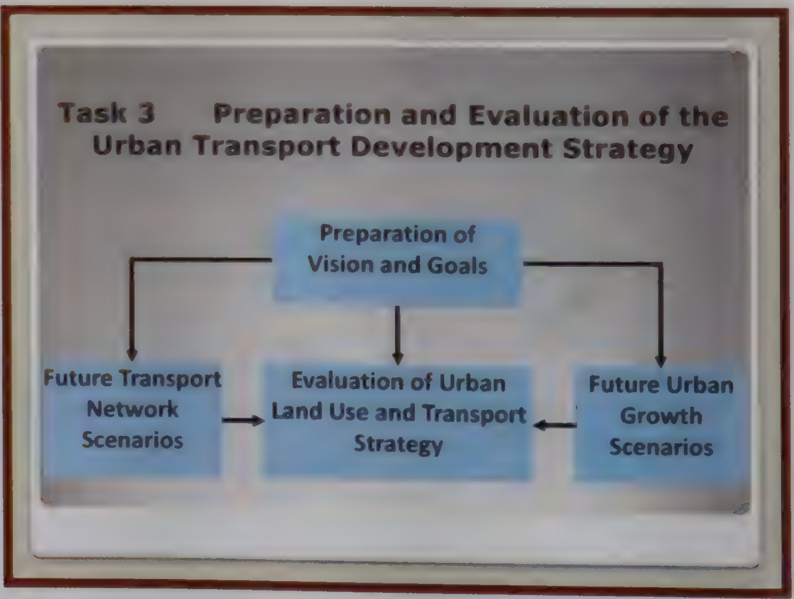
Task 1 Identification of Scope

- *Planning Area*
  - *Metropolitan Area is preferable*
  - *Include also major activity centres (e.g. SEZs) in the metropolitan regions*
- *Planning Horizon (Synchronize with the Master Plan)*
  - *Target year: 30 years*
  - *Mid-term target: 10 years*
  - *Short-term target: 5 years*
  - *Immediate Projects*



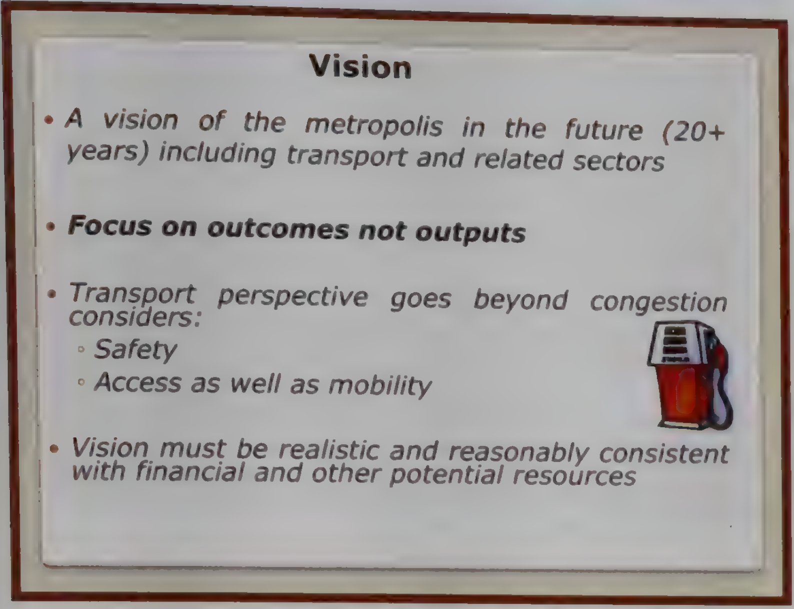
Task 2 Data Collection and Analysis of the Existing Urban Land Use and Transport Environment

Review of City Profile
Review of Existing Transport Systems
Transport Demand Surveys
Review of Land Use Plan
Analysis of Existing Traffic/Transport Conditions



Task 3 Preparation and Evaluation of the Urban Transport Development Strategy

Preparation of Vision and Goals
Future Transport Network Scenarios
Evaluation of Urban Land Use and Transport Strategy
Future Urban Growth Scenarios

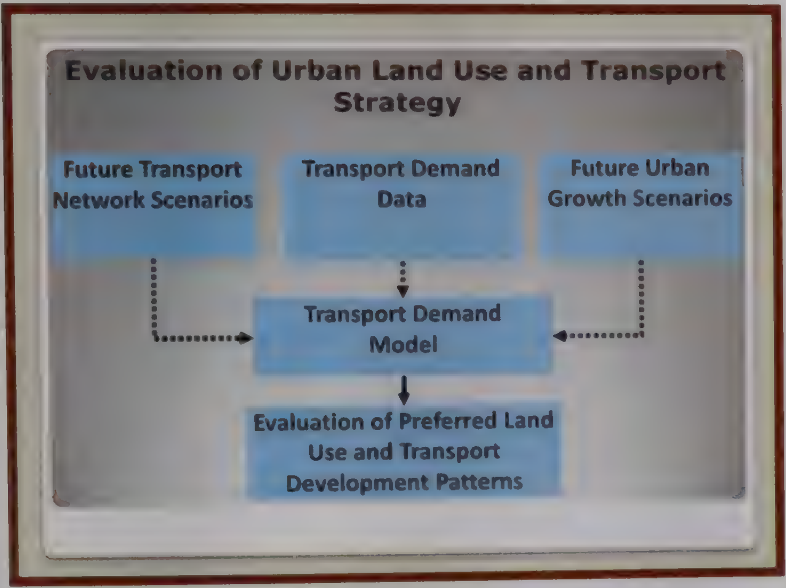


Vision

- *A vision of the metropolis in the future (20+ years) including transport and related sectors*
- ***Focus on outcomes not outputs***
- *Transport perspective goes beyond congestion considers:*
  - *Safety*
  - *Access as well as mobility*
- *Vision must be realistic and reasonably consistent with financial and other potential resources*

Goals, Objectives, Criteria Linked to Vision

- *Vision may be a safe, secure, sustainable city with equitable services and economic opportunity*
- *Goal for transport system may be clean, safe, secure, affordable access and mobility for all*
- *Objective may be everyone with reasonable access to employment*
- *Criteria may be % of jobs within 45 minutes of all residents*



Evaluation of Urban Land Use and Transport Strategy

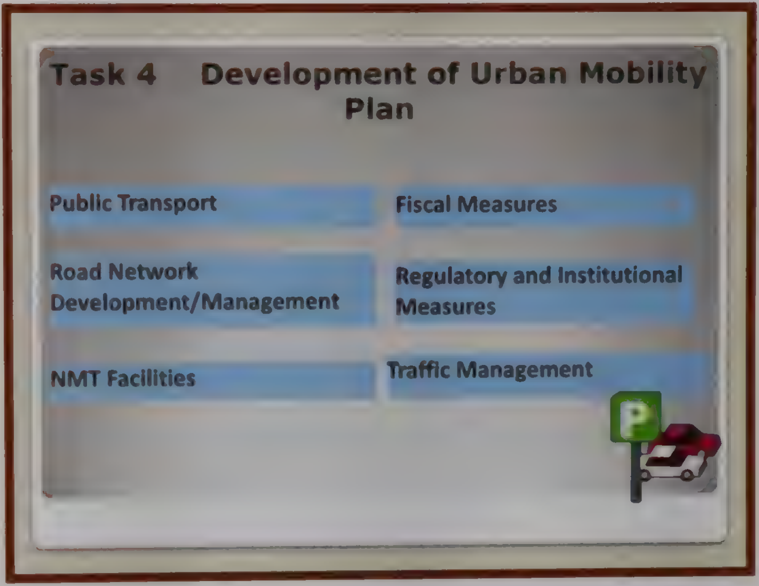
Future Transport Network Scenarios

Transport Demand Data

Future Urban Growth Scenarios

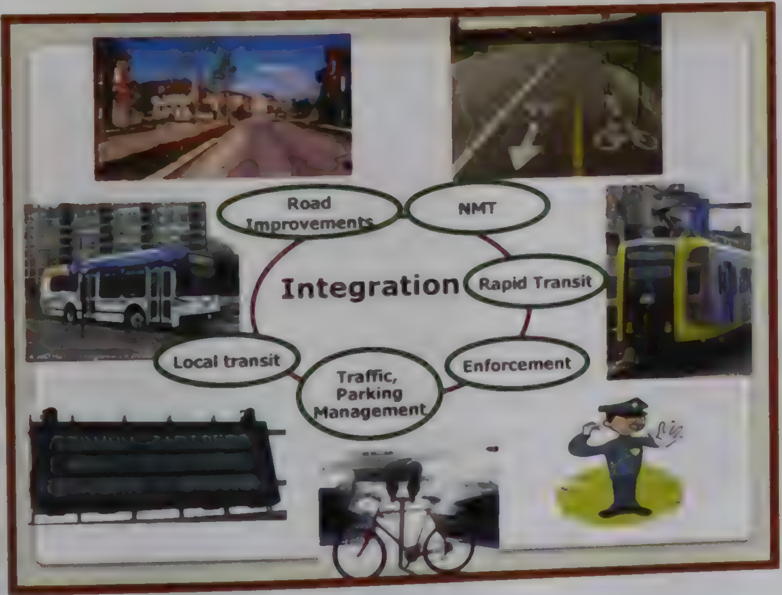
Transport Demand Model

Evaluation of Preferred Land Use and Transport Development Patterns



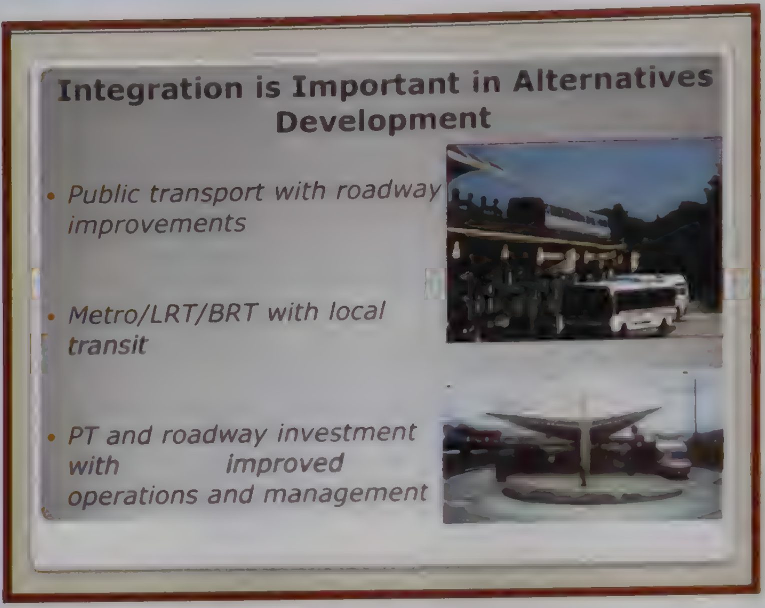
Task 4 Development of Urban Mobility Plan

Public Transport	Fiscal Measures
Road Network Development/Management	Regulatory and Institutional Measures
NMT Facilities	Traffic Management



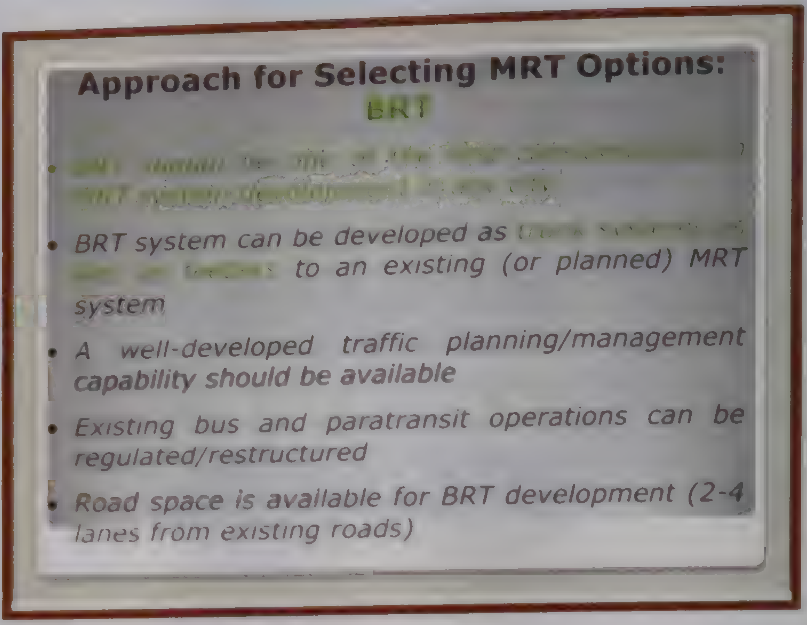
Public Transport

1. Bus Service Improvement Plan
2. Appropriate MRT Options
3. MRT Development Plan
4. Trunk and Feeder Network
5. Intermodal Facility Plan



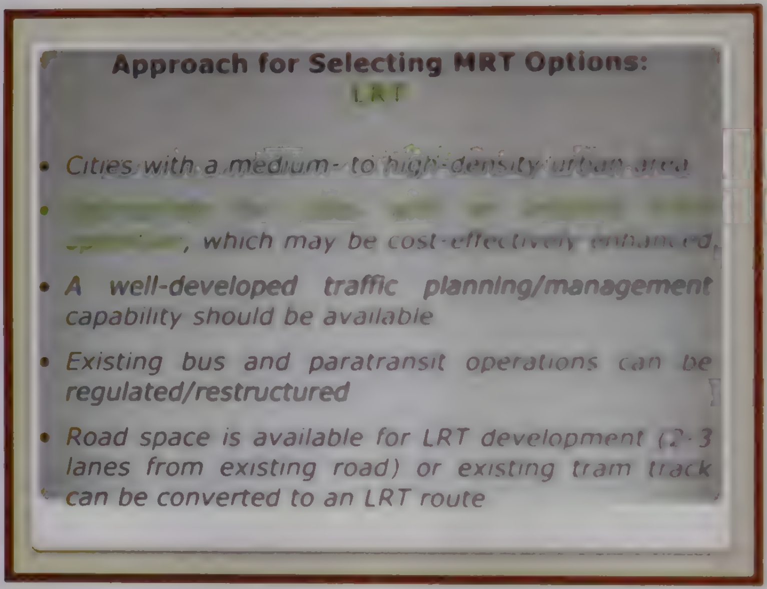
Integration is Important in Alternatives Development

- Public transport with roadway improvements
- Metro/LRT/BRT with local transit
- PT and roadway investment with improved operations and management



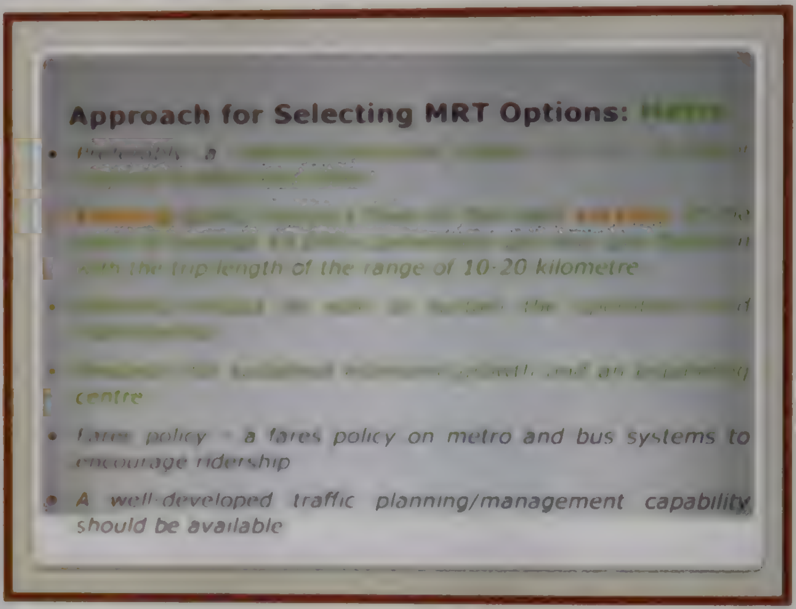
Approach for Selecting MRT Options: BRT

- [illegible]
- BRT system can be developed as [illegible] to an existing (or planned) MRT system
- A well-developed traffic planning/management capability should be available
- Existing bus and paratransit operations can be regulated/restructured
- Road space is available for BRT development (2-4 lanes from existing roads)



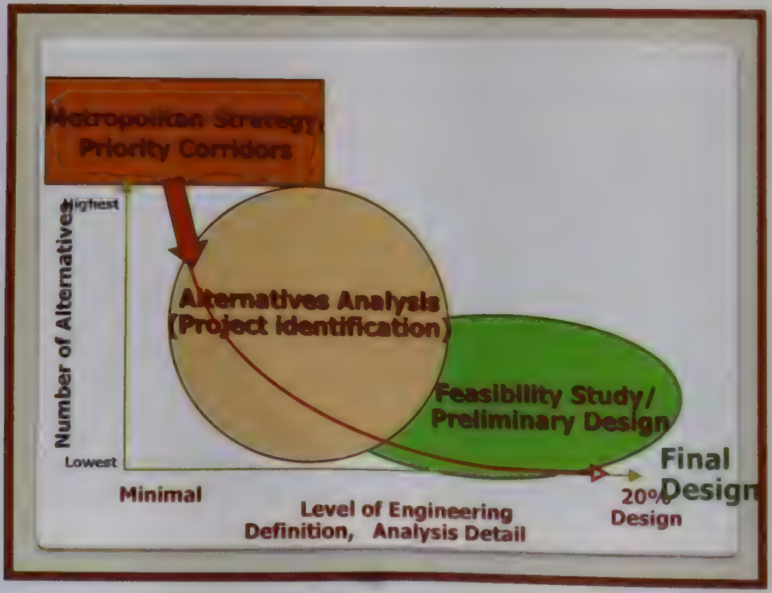
Approach for Selecting MRT Options: LRT

- Cities with a medium- to high-density urban area
- [illegible], which may be cost-effectively enhanced,
- A well-developed traffic planning/management capability should be available
- Existing bus and paratransit operations can be regulated/restructured
- Road space is available for LRT development (2-3 lanes from existing road) or existing tram track can be converted to an LRT route



Approach for Selecting MRT Options: [illegible]

- Preferably a [illegible]
- [illegible] with the trip length of the range of 10-20 kilometre
- [illegible]
- [illegible] centre
- Fares policy - a fares policy on metro and bus systems to encourage ridership
- A well-developed traffic planning/management capability should be available



Metropolitan Strategy Priority Corridors

Alternatives Analysis (Project identification)

Feasibility Study/ Preliminary Design

Final Design

Number of Alternatives

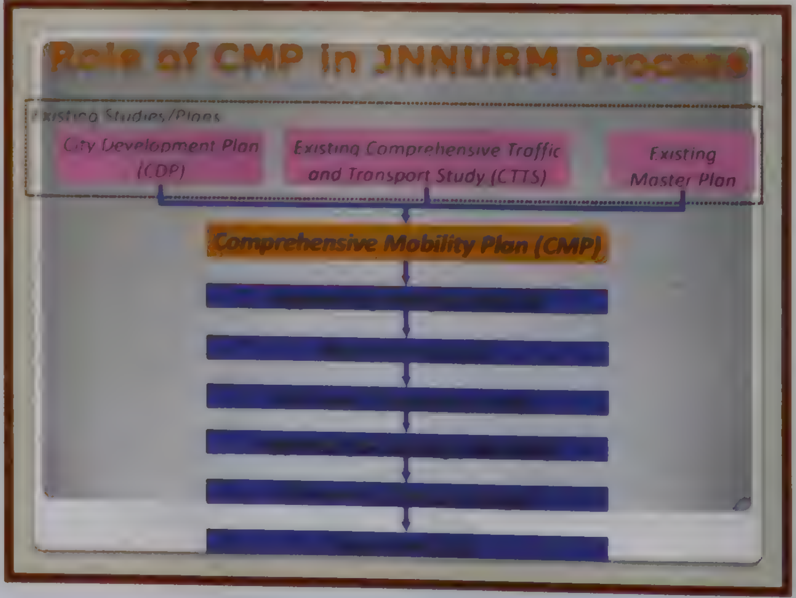
Highest

Lowest

Minimal

Level of Engineering Definition, Analysis Detail

20% Design



Role of CMP in JNNURM Process

Existing Studies/Plans

City Development Plan (CDP)

Existing Comprehensive Traffic and Transport Study (CTTS)

Existing Master Plan

Comprehensive Mobility Plan (CMP)

Question and Answer:

Q.How a CMP should get acceptance?

Ans.The prepared CMP (Comprehensive Mobility Plan) can get the acceptance from the Ministry of Urban Transport (MoUD)

Q. How CDP and CMP are different?

Ans: City Development Plan (CDP) discusses about the master plan of a city. Generally, it does not discuss about the aspect of mobility, performance of the transport and the study does not look into the relation between the land-use and transport with the help of land-use transport models. With the raising need and concerns for these changes to incorporate, it is made mandatory by MoUD to conduct Comprehensive Mobility Plan (CMP) where these issues are taken care.

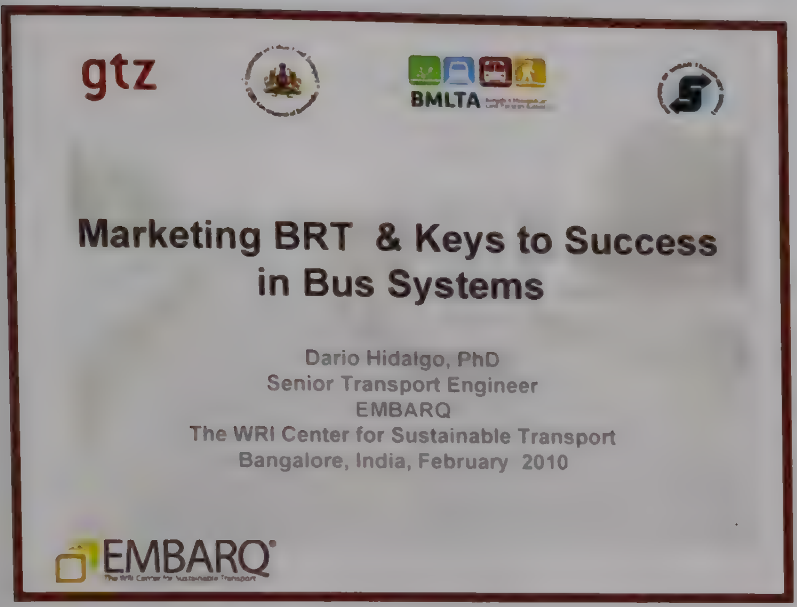
In future, there would probably not be individual reports of CDP and CMP for a city but there would be a single report which covers all.

Session 8: Marketing a BRT system

In the final presentation by Dr. Dario Hidalgo, the need for marketing a BRT system was stated. He compared the components of BRT systems of Delhi, Guadalajara and Ahmedabad with respect to the advances and improvements to be made.

**Note: The workshop was very interactive and involved many queries and replies but this report covers only main questions & answers of discussion sessions.*

**Detailed presentations can be downloaded from http://www.bmlta.org*



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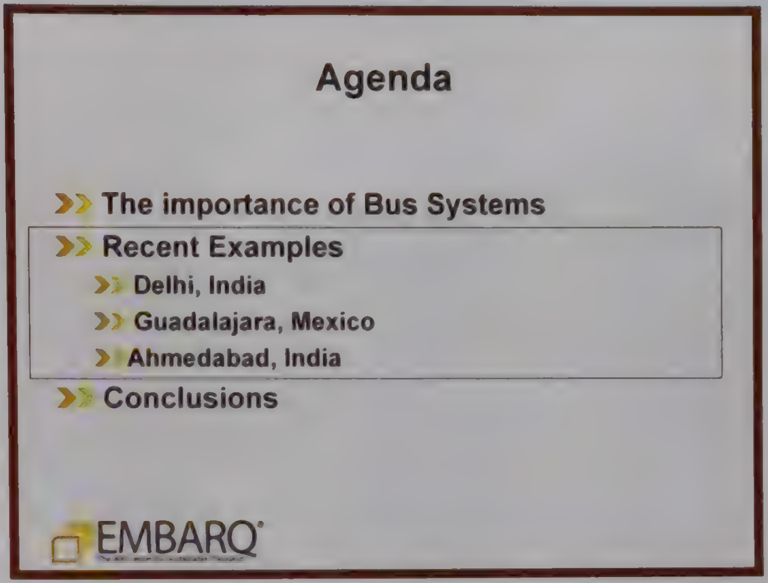
BMLTA

Marketing BRT & Keys to Success in Bus Systems

Dario Hidalgo, PhD
Senior Transport Engineer
EMBARQ
The WRI Center for Sustainable Transport
Bangalore, India, February 2010

EMBARQ



Agenda

- The importance of Bus Systems
- Recent Examples
  - Delhi, India
  - Guadalajara, Mexico
  - Ahmedabad, India
- Conclusions

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Sustainable Urban Transport

- Pedestrian and Bicycles
- Public Transportation
- Transit Oriented Development
- Disincentives to Car Use

Bycicle Tracks and Pedestrian Facilities – Delhi BRT Corridor

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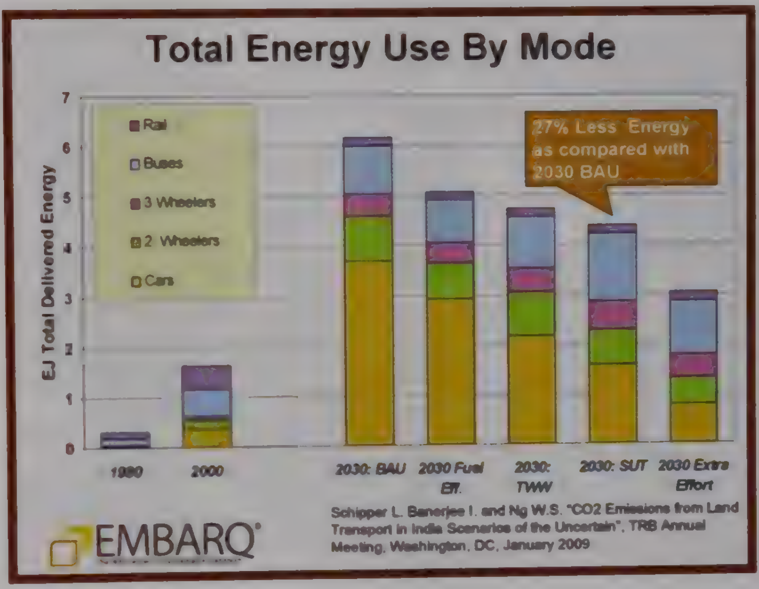
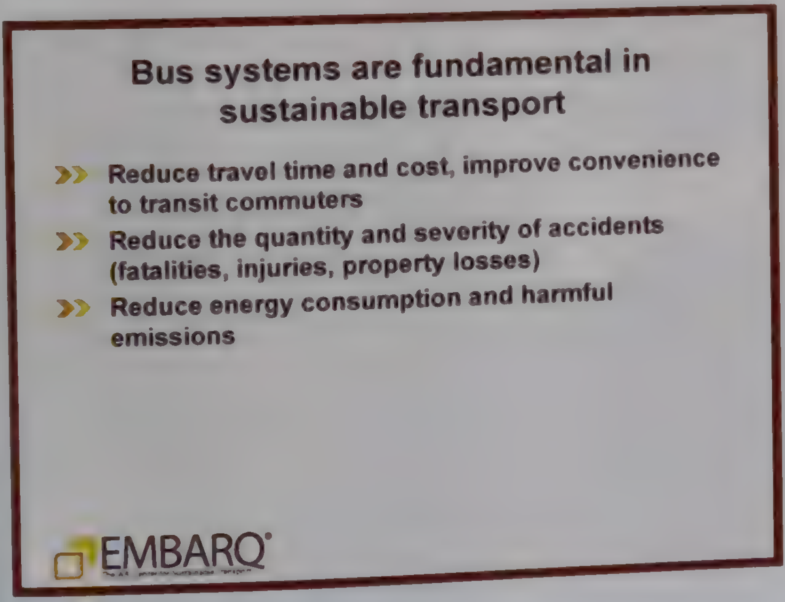


Total Energy Use By Mode

Schipper L. Banerjee I. and Ng W.S. "CO2 Emissions from Land Transport in India Scenarios of the Uncertain", TRB Annual Meeting, Washington, DC, January 2009

EMBARQ



Bus systems are fundamental in sustainable transport

- Reduce travel time and cost, improve convenience to transit commuters
- Reduce the quantity and severity of accidents (fatalities, injuries, property losses)
- Reduce energy consumption and harmful emissions

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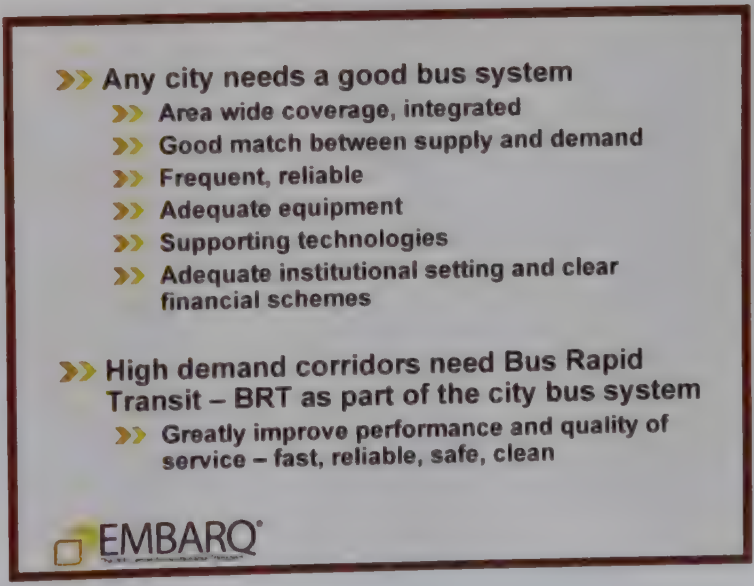

- Any city needs a good bus system
  - Area wide coverage, integrated
  - Good match between supply and demand
  - Frequent, reliable
  - Adequate equipment
  - Supporting technologies
  - Adequate institutional setting and clear financial schemes
- High demand corridors need Bus Rapid Transit – BRT as part of the city bus system
  - Greatly improve performance and quality of service – fast, reliable, safe, clean

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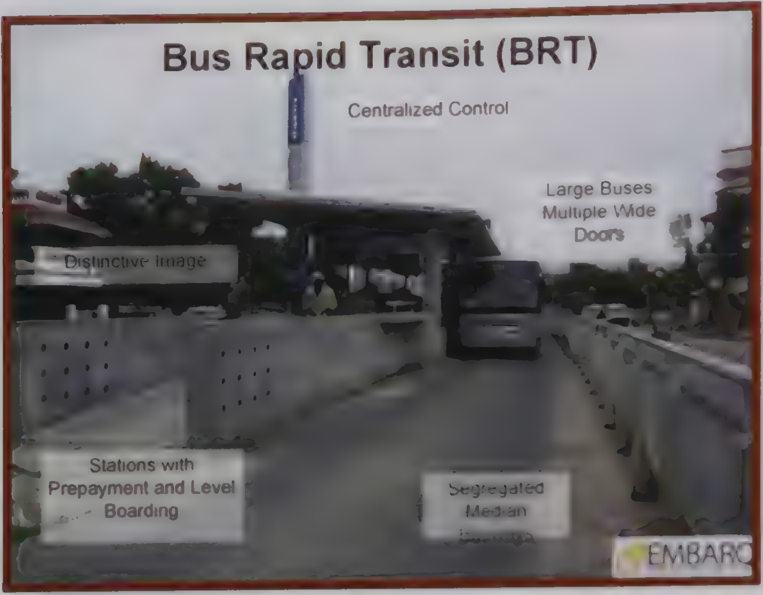
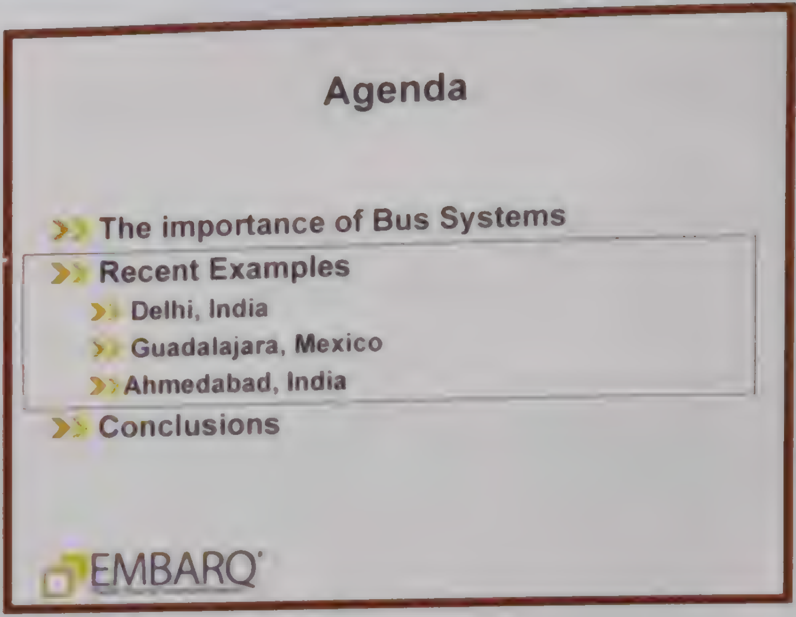


Bus Rapid Transit (BRT)

Centralized Control
Large Buses Multiple Wide Doors
Distinctive Image
Stations with Prepayment and Level Boarding
Segregated Median
EMBARQ



Agenda

- The importance of Bus Systems
- Recent Examples
  - Delhi, India
  - Guadalajara, Mexico
  - Ahmedabad, India
- Conclusions

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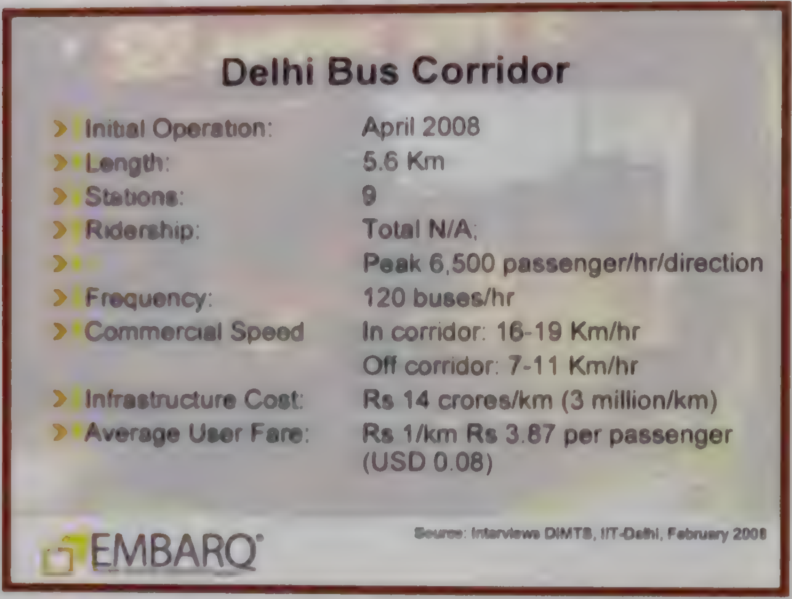
Delhi Bus Corridor



Delhi Bus Corridor

Initial Operation:	April 2008
Length:	5.6 Km
Stations:	9
Ridership:	Total N/A;
	Peak 6,500 passenger/hr/direction
Frequency:	120 buses/hr
Commercial Speed	In corridor: 16-19 Km/hr
	Off corridor: 7-11 Km/hr
Infrastructure Cost:	Rs 14 crores/km (3 million/km)
Average User Fare:	Rs 1/km Rs 3.87 per passenger (USD 0.08)

Source: Interviews DIMTS, IIT-Delhi, February 2008

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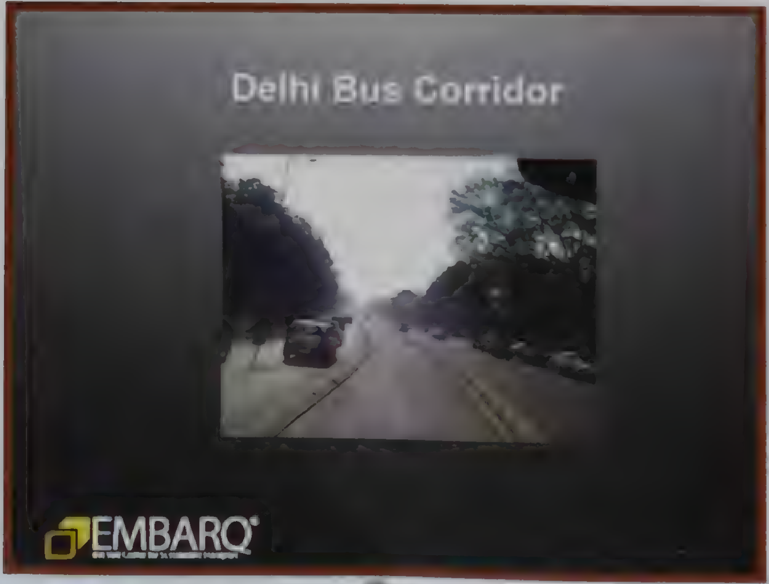
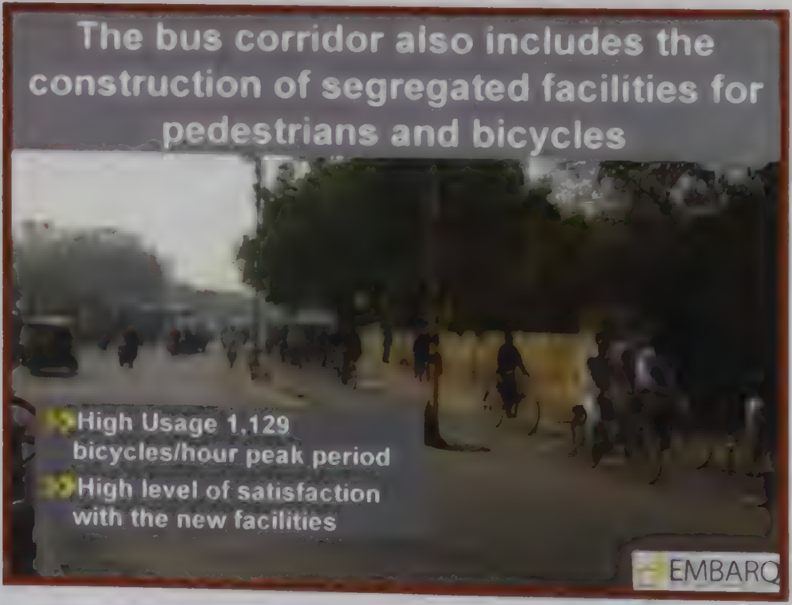
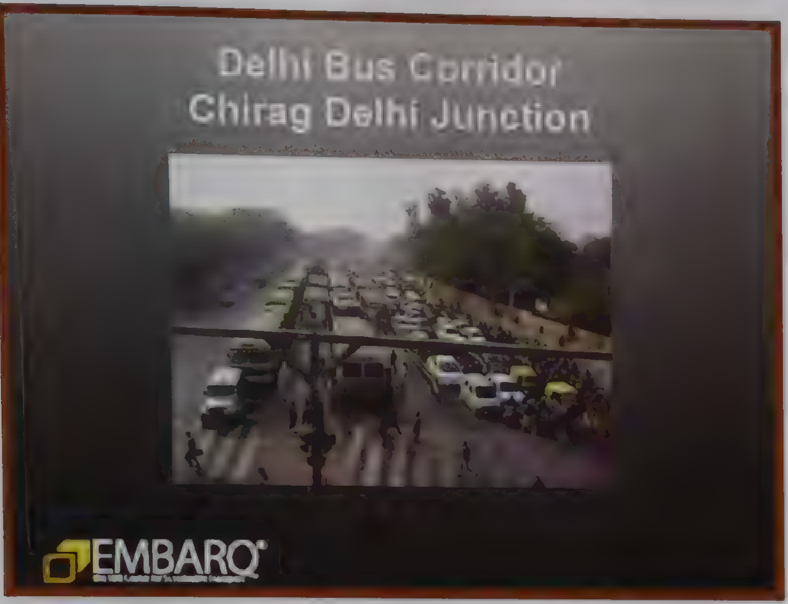


Delhi Bus Corridor

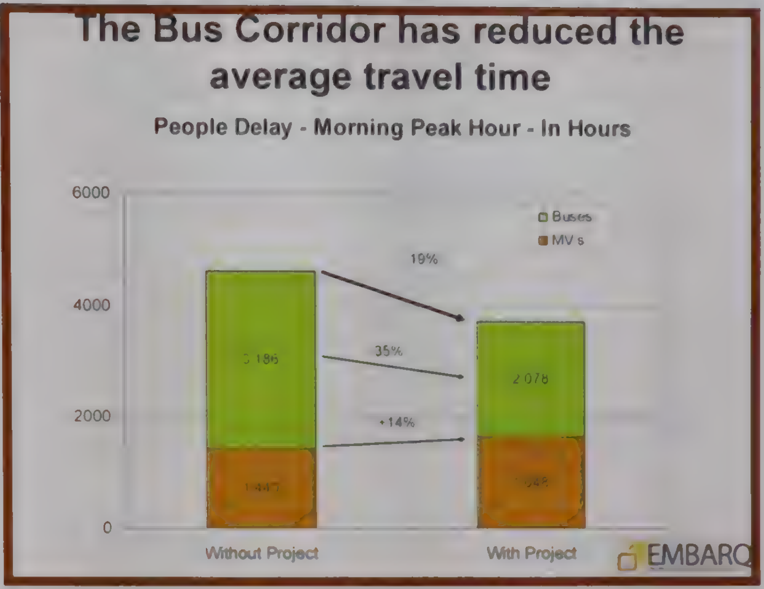


The bus corridor also includes the construction of segregated facilities for pedestrians and bicycles

- High Usage 1,129 bicycles/hour peak period
- High level of satisfaction with the new facilities

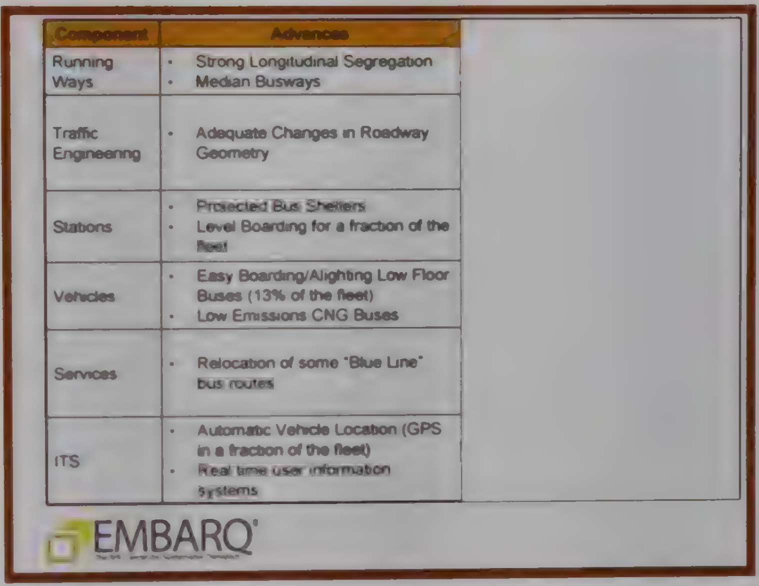


Delhi Bus Corridor Chirag Delhi Junction

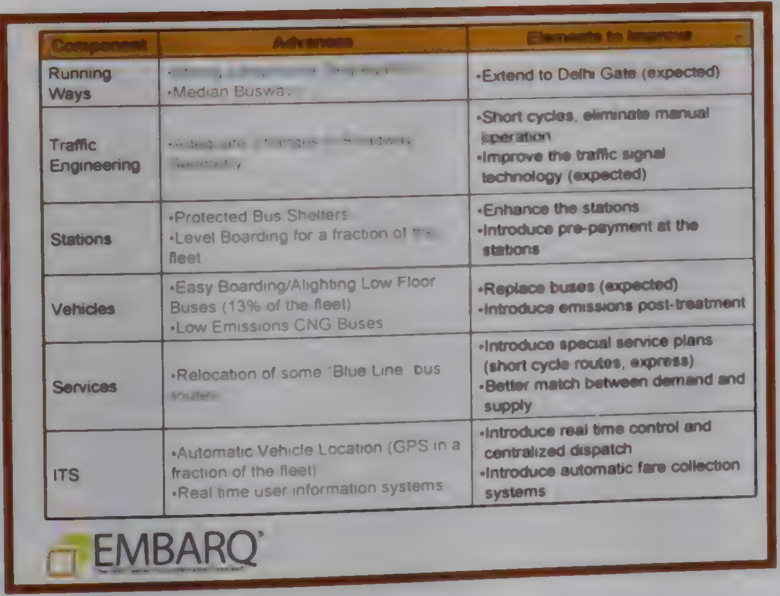


The Bus Corridor has reduced the average travel time

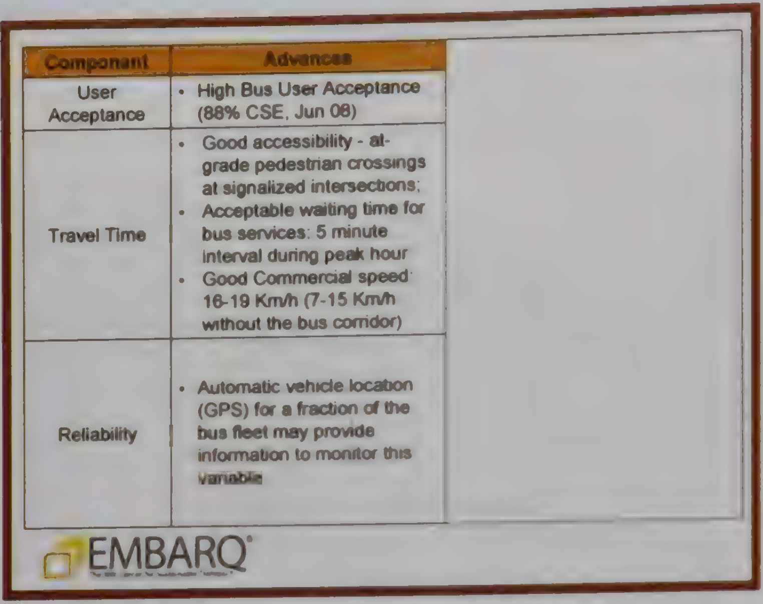
People Delay - Morning Peak Hour - In Hours



Component	Advances
Running Ways	• Strong Longitudinal Segregation • Median Busways
Traffic Engineering	• Adequate Changes in Roadway Geometry
Stations	• Protected Bus Shelters • Level Boarding for a fraction of the fleet
Vehicles	• Easy Boarding/Alighting Low Floor Buses (13% of the fleet) • Low Emissions CNG Buses
Services	• Relocation of some "Blue Line" bus routes
ITS	• Automatic Vehicle Location (GPS in a fraction of the fleet) • Real time user information systems



Component	Advances	Elements to Improve
Running Ways	•Strong Longitudinal Segregation •Median Busways	•Extend to Delhi Gate (expected)
Traffic Engineering	•Adequate Changes in Roadway Geometry	•Short cycles, eliminate manual operation •Improve the traffic signal technology (expected)
Stations	•Protected Bus Shelters •Level Boarding for a fraction of the fleet	•Enhance the stations •Introduce pre-payment at the stations
Vehicles	•Easy Boarding/Alighting Low Floor Buses (13% of the fleet) •Low Emissions CNG Buses	•Replace buses (expected) •Introduce emissions post-treatment
Services	•Relocation of some "Blue Line" bus routes	•Introduce special service plans (short cycle routes, express) •Better match between demand and supply
ITS	•Automatic Vehicle Location (GPS in a fraction of the fleet) •Real time user information systems	•Introduce real time control and centralized dispatch •Introduce automatic fare collection systems



Component	Advances
User Acceptance	• High Bus User Acceptance (88% CSE, Jun 08)
Travel Time	• Good accessibility - at-grade pedestrian crossings at signalized intersections; • Acceptable waiting time for bus services: 5 minute interval during peak hour • Good Commercial speed: 16-19 Km/h (7-15 Km/h without the bus corridor)
Reliability	• Automatic vehicle location (GPS) for a fraction of the bus fleet may provide information to monitor this variable

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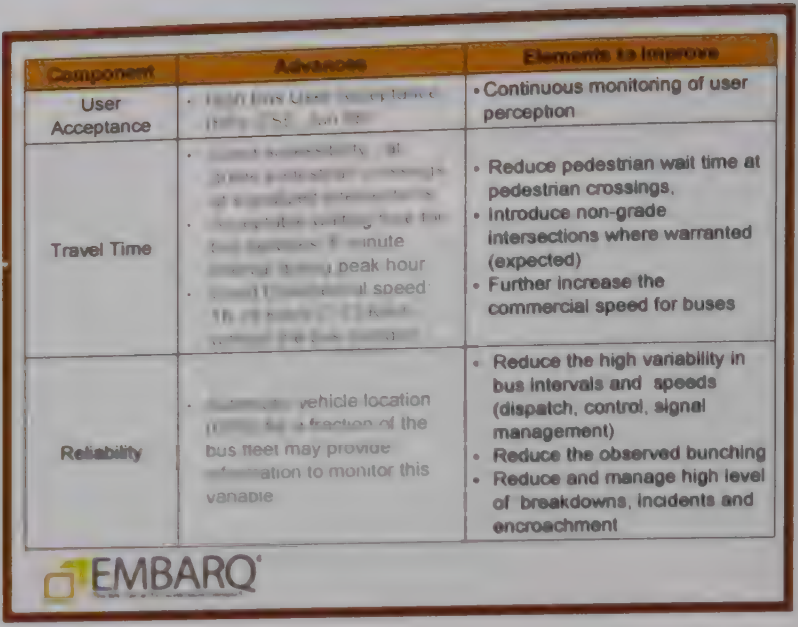

Component	Advances	Elements to improve
User Acceptance	• [illegible]	• Continuous monitoring of user perception
Travel Time	• [illegible] • [illegible] 5 minute [illegible] peak hour • [illegible] speed [illegible]	• Reduce pedestrian wait time at pedestrian crossings, • Introduce non-grade intersections where warranted (expected) • Further increase the commercial speed for buses
Reliability	• [illegible] vehicle location [illegible] fraction of the bus fleet may provide [illegible]ation to monitor this variable	• Reduce the high variability in bus intervals and speeds (dispatch, control, signal management) • Reduce the observed bunching • Reduce and manage high level of breakdowns, incidents and encroachment

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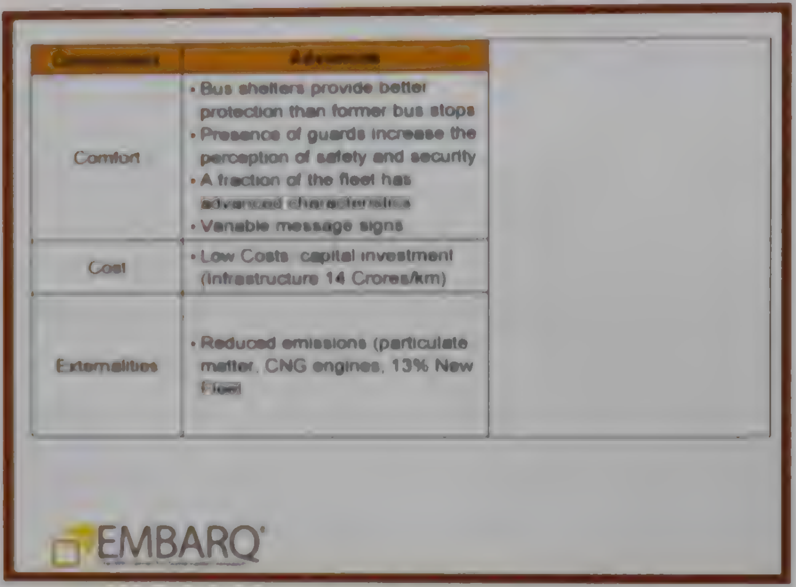

Component	Advances
Comfort	• Bus shelters provide better protection than former bus stops • Presence of guards increase the perception of safety and security • A fraction of the fleet has advanced characteristics • Variable message signs
Cost	• Low Costs capital investment (Infrastructure 14 Crores/km)
Externalities	• Reduced emissions (particulate matter, CNG engines, 13% New Fleet

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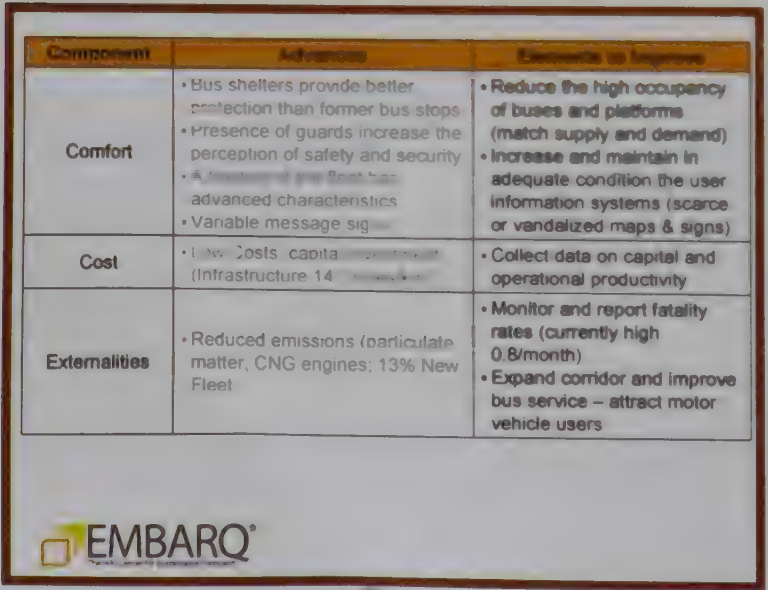

Component	Advances	Elements to improve
Comfort	• Bus shelters provide better protection than former bus stops • Presence of guards increase the perception of safety and security • A [illegible] advanced characteristics • Variable message sig[illegible]	• Reduce the high occupancy of buses and platforms (match supply and demand) • Increase and maintain in adequate condition the user information systems (scarce or vandalized maps & signs)
Cost	• Low Costs capita[illegible] (Infrastructure 14 [illegible]	• Collect data on capital and operational productivity
Externalities	• Reduced emissions (particulate matter, CNG engines; 13% New Fleet	• Monitor and report fatality rates (currently high 0.8/month) • Expand corridor and improve bus service – attract motor vehicle users

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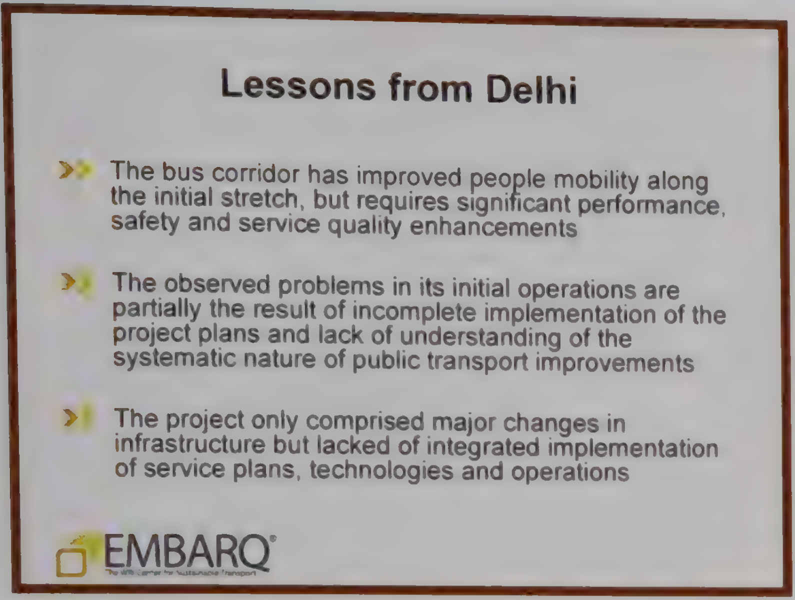

Lessons from Delhi

- The bus corridor has improved people mobility along the initial stretch, but requires significant performance, safety and service quality enhancements
- The observed problems in its initial operations are partially the result of incomplete implementation of the project plans and lack of understanding of the systematic nature of public transport improvements
- The project only comprised major changes in infrastructure but lacked of integrated implementation of service plans, technologies and operations

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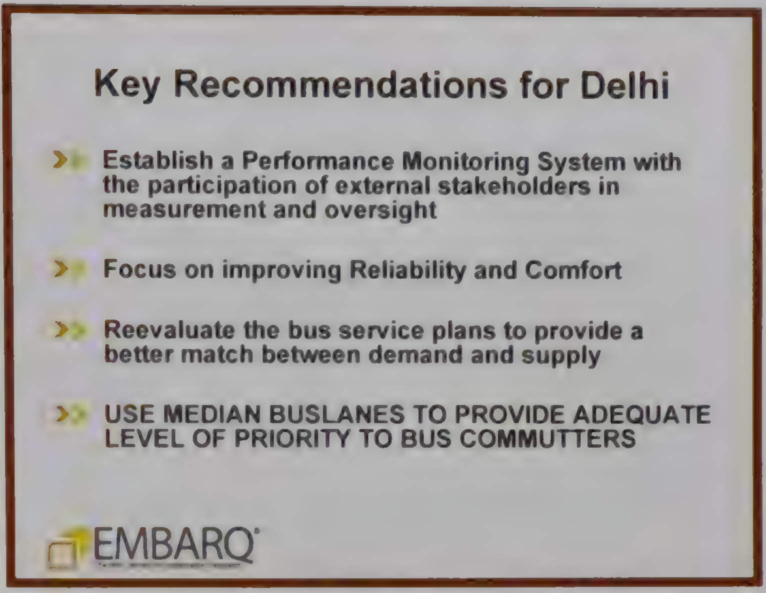

Key Recommendations for Delhi

- **Establish a Performance Monitoring System with the participation of external stakeholders in measurement and oversight**
- **Focus on improving Reliability and Comfort**
- **Reevaluate the bus service plans to provide a better match between demand and supply**
- USE MEDIAN BUSLANES TO PROVIDE ADEQUATE LEVEL OF PRIORITY TO BUS COMMUTTERS

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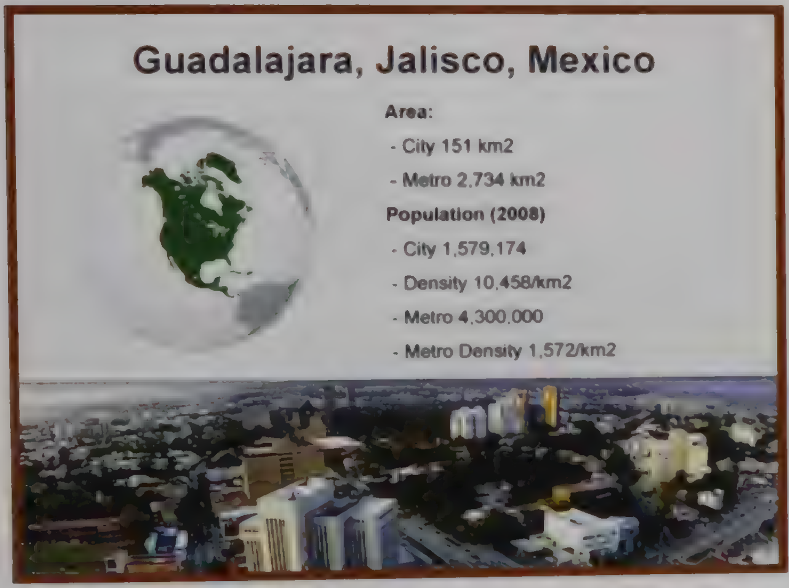

Guadalajara, Jalisco, Mexico

Area:
- City 151 km2
- Metro 2,734 km2

Population (2008)
- City 1,579,174
- Density 10,458/km2
- Metro 4,300,000
- Metro Density 1,572/km2

Macrobus Guadalajra, Mexico

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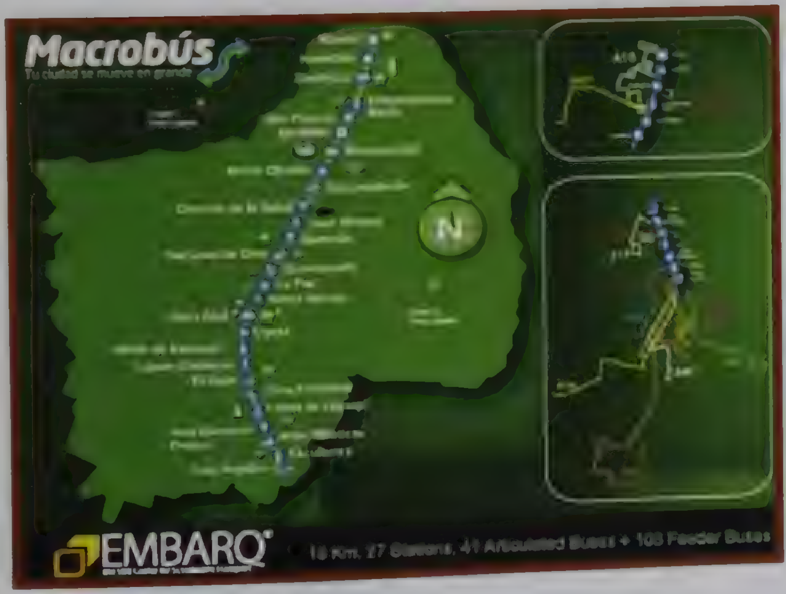
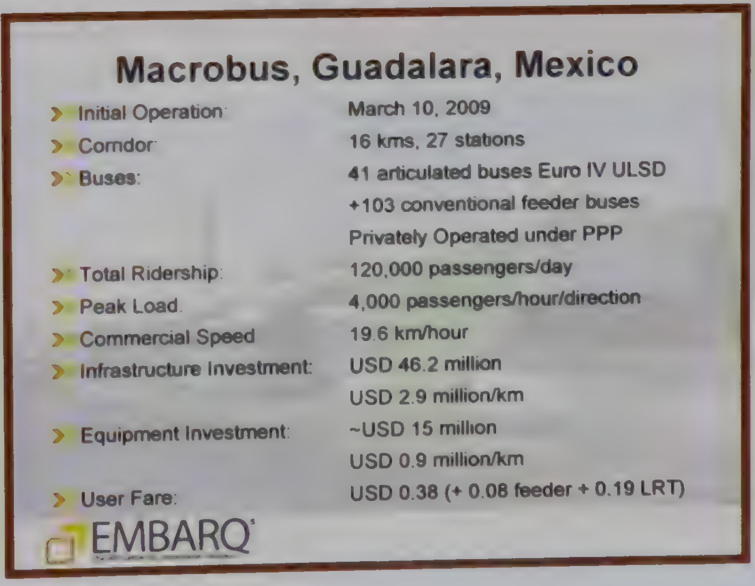


EMBARQ 16 Km. 27 Stations, 41 Articulated Buses + 103 Feeder Buses



Macrobus, Guadalara, Mexico

Initial Operation:	March 10, 2009
Corridor:	16 kms, 27 stations
Buses:	41 articulated buses Euro IV ULSD +103 conventional feeder buses Privately Operated under PPP
Total Ridership:	120,000 passengers/day
Peak Load:	4,000 passengers/hour/direction
Commercial Speed	19.6 km/hour
Infrastructure Investment:	USD 46.2 million USD 2.9 million/km
Equipment Investment:	~USD 15 million USD 0.9 million/km
User Fare:	USD 0.38 (+ 0.08 feeder + 0.19 LRT)

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Macrobus, Guadalajara, Mexico

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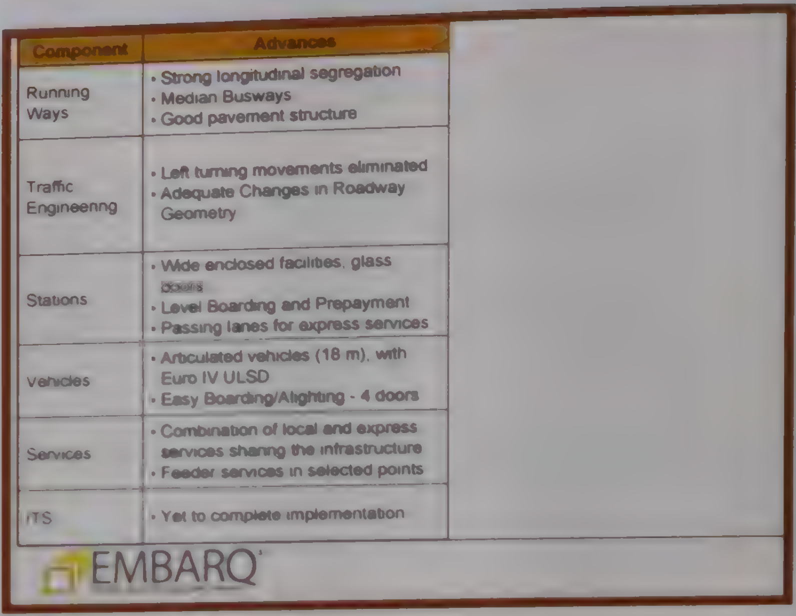
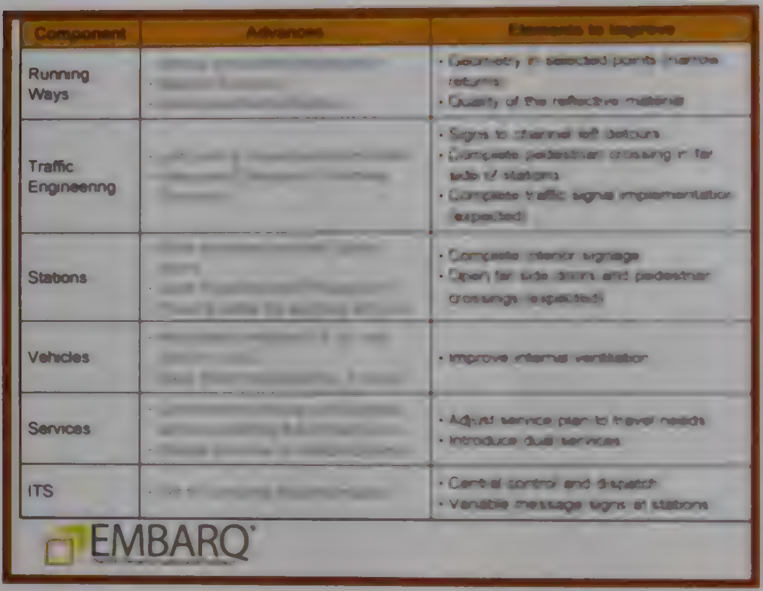


Component	Advances
Running Ways	• Strong longitudinal segregation • Median Busways • Good pavement structure
Traffic Engineering	• Left turning movements eliminated • Adequate Changes in Roadway Geometry
Stations	• Wide enclosed facilities, glass doors • Level Boarding and Prepayment • Passing lanes for express services
Vehicles	• Articulated vehicles (18 m), with Euro IV ULSD • Easy Boarding/Alighting - 4 doors
Services	• Combination of local and express services sharing the infrastructure • Feeder services in selected points
ITS	• Yet to complete implementation

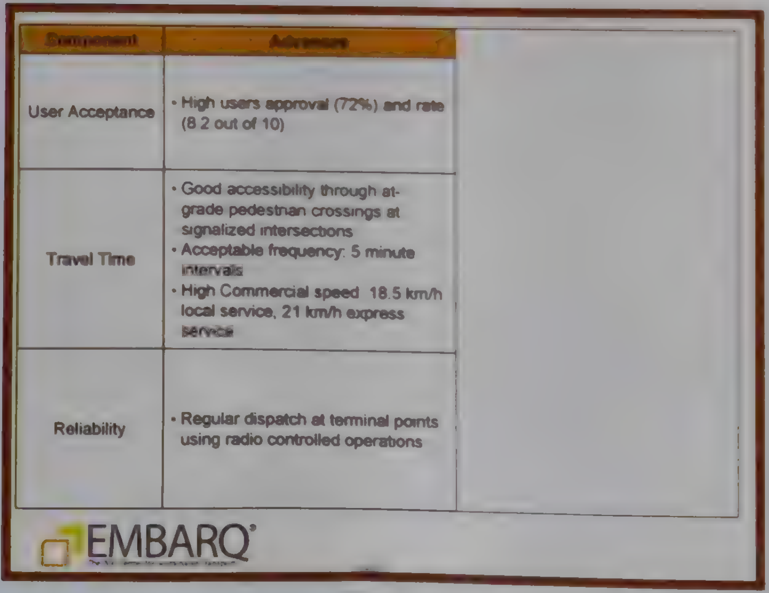
EMBARQ



Component	Advances	Elements to improve
Running Ways	[illegible]	• Geometry in selected points (narrow returns) • Quality of the reflective material
Traffic Engineering	[illegible]	• Signs to channel left detours • Complete pedestrian crossing in far side of stations • Complete traffic signal implementation (expected)
Stations	[illegible]	• Complete interior signage • Open far side doors and pedestrian crossings (expected)
Vehicles	[illegible]	• Improve internal ventilation
Services	[illegible]	• Adjust service plan to travel needs • Introduce dual services
ITS	[illegible]	• Central control and dispatch • Variable message signs at stations

EMBARQ

EMBARQ



Component	Advances
User Acceptance	• High users approval (72%) and rate (8.2 out of 10)
Travel Time	• Good accessibility through at-grade pedestrian crossings at signalized intersections • Acceptable frequency: 5 minute intervals • High Commercial speed: 18.5 km/h local service, 21 km/h express service
Reliability	• Regular dispatch at terminal points using radio controlled operations

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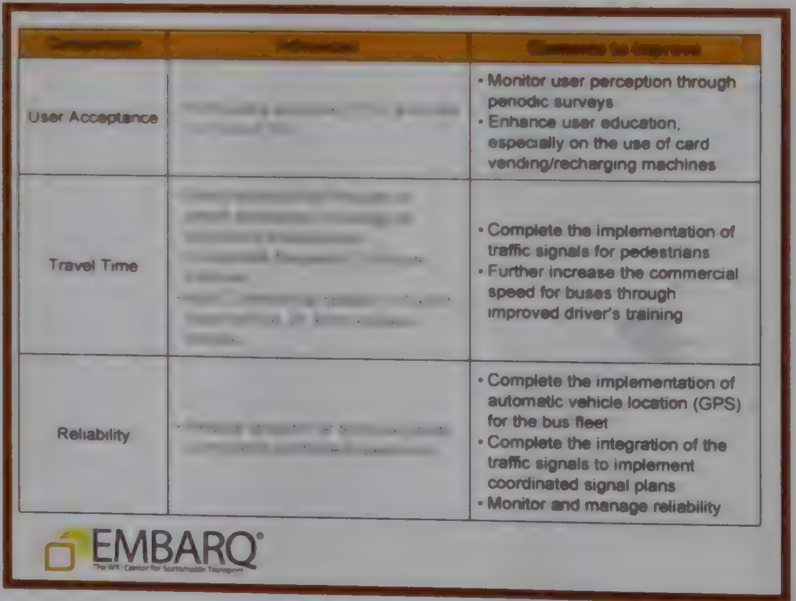

Component	Advances	Elements to improve
User Acceptance	[illegible]	• Monitor user perception through periodic surveys • Enhance user education, especially on the use of card vending/recharging machines
Travel Time	[illegible]	• Complete the implementation of traffic signals for pedestrians • Further increase the commercial speed for buses through improved driver's training
Reliability	[illegible]	• Complete the implementation of automatic vehicle location (GPS) for the bus fleet • Complete the integration of the traffic signals to implement coordinated signal plans • Monitor and manage reliability

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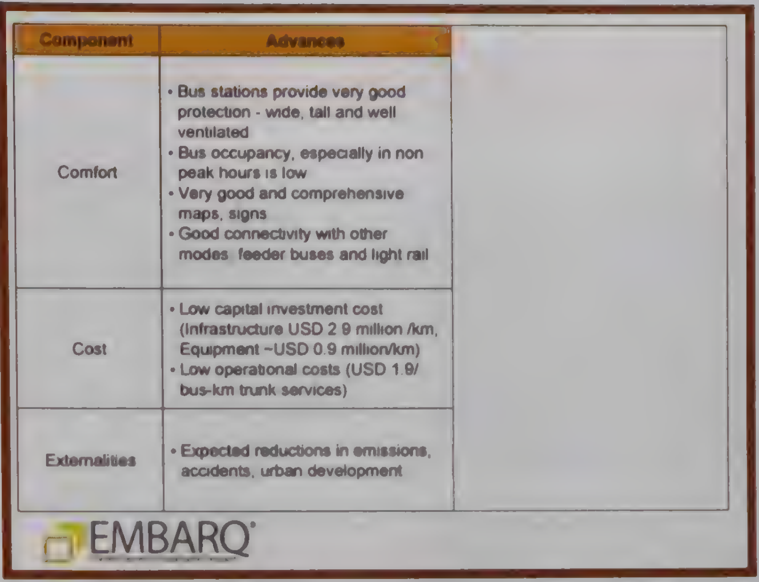
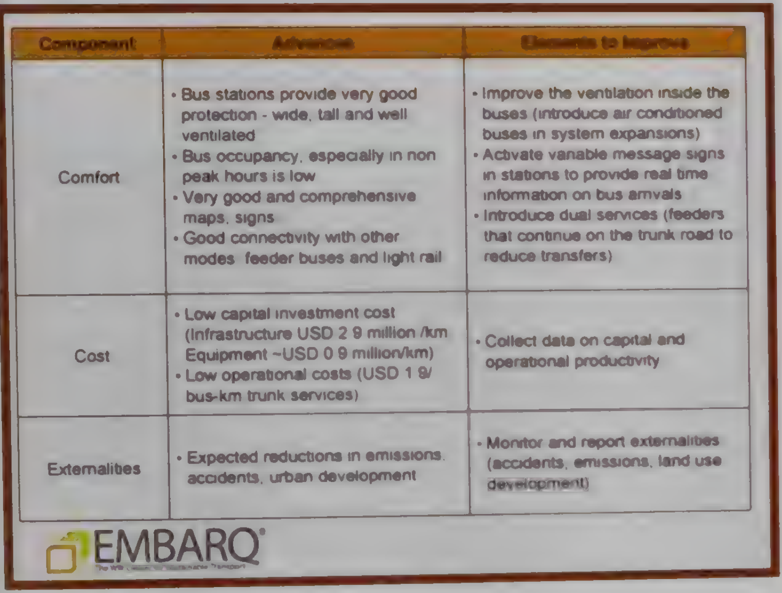
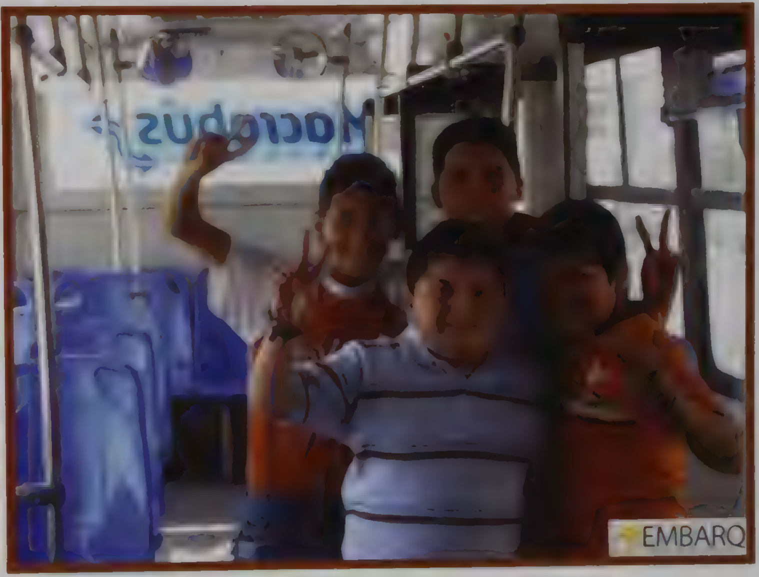
The WRI Center for Sustainable Transport

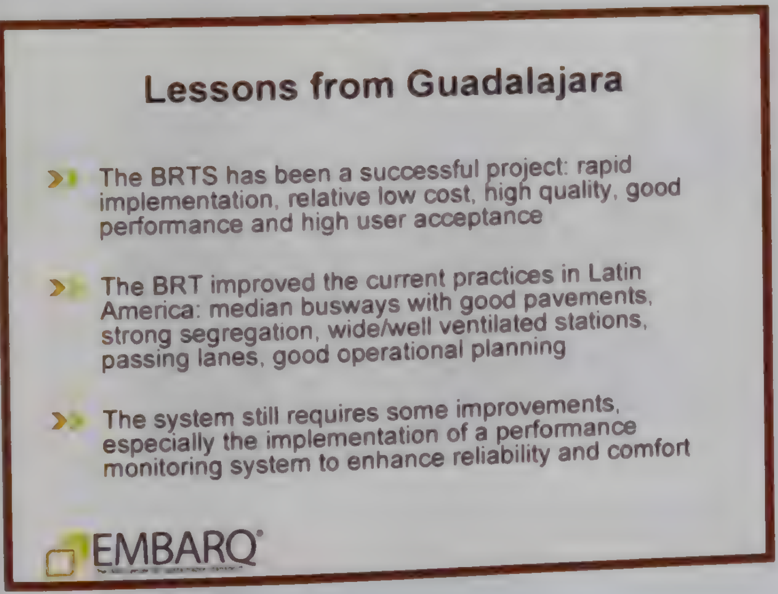


Component	Advances
Comfort	• Bus stations provide very good protection - wide, tall and well ventilated • Bus occupancy, especially in non peak hours is low • Very good and comprehensive maps, signs • Good connectivity with other modes feeder buses and light rail
Cost	• Low capital investment cost (Infrastructure USD 2 9 million /km, Equipment ~USD 0.9 million/km) • Low operational costs (USD 1 9/ bus-km trunk services)
Externalities	• Expected reductions in emissions, accidents, urban development



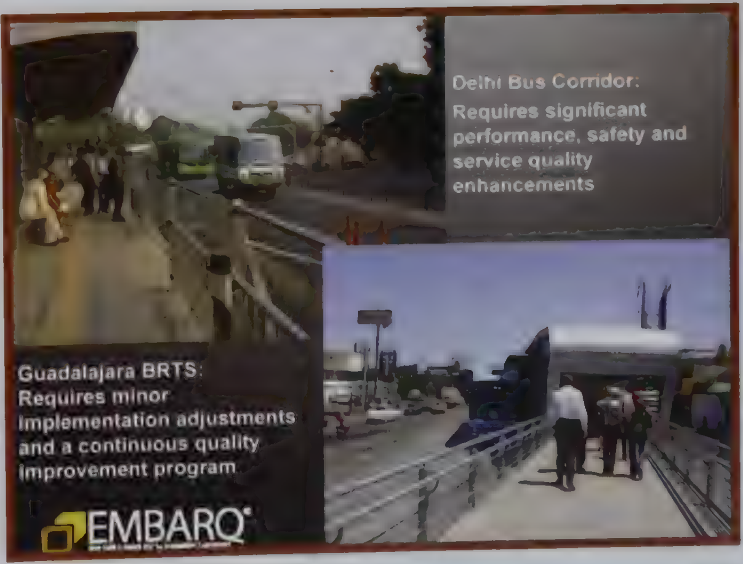
Component	Advances	Elements to Improve
Comfort	• Bus stations provide very good protection - wide, tall and well ventilated • Bus occupancy, especially in non peak hours is low • Very good and comprehensive maps, signs • Good connectivity with other modes feeder buses and light rail	• Improve the ventilation inside the buses (introduce air conditioned buses in system expansions) • Activate variable message signs in stations to provide real time information on bus arrivals • Introduce dual services (feeders that continue on the trunk road to reduce transfers)
Cost	• Low capital investment cost (Infrastructure USD 2 9 million /km Equipment ~USD 0 9 million/km) • Low operational costs (USD 1 9/ bus-km trunk services)	• Collect data on capital and operational productivity
Externalities	• Expected reductions in emissions, accidents, urban development	• Monitor and report externalities (accidents, emissions, land use development)





Lessons from Guadalajara

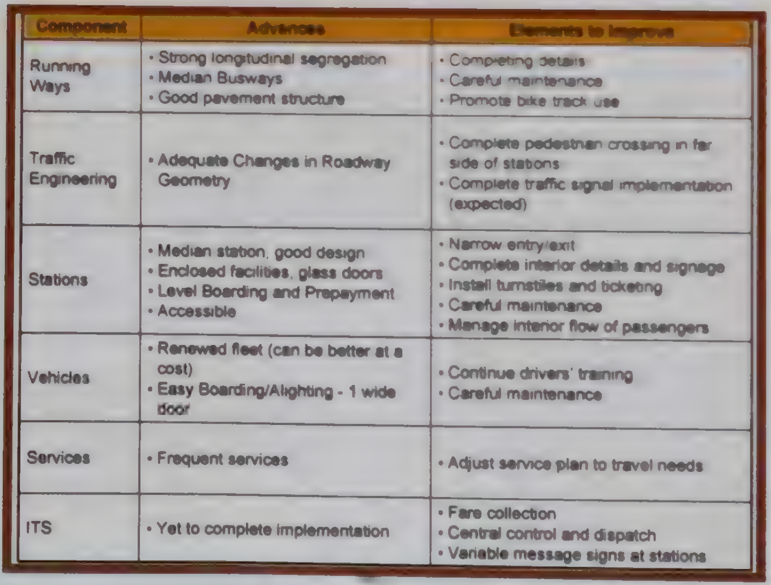
- The BRTS has been a successful project: rapid implementation, relative low cost, high quality, good performance and high user acceptance
- The BRT improved the current practices in Latin America: median busways with good pavements, strong segregation, wide/well ventilated stations, passing lanes, good operational planning
- The system still requires some improvements, especially the implementation of a performance monitoring system to enhance reliability and comfort



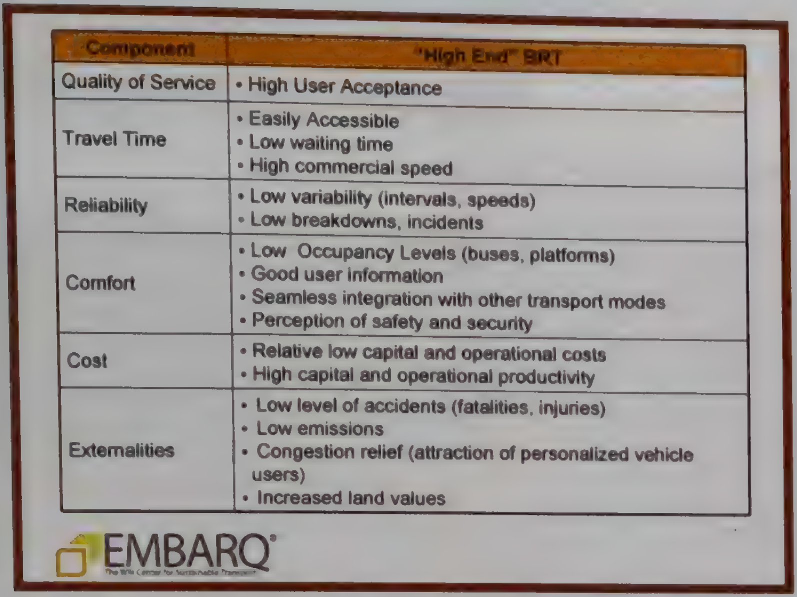
Delhi Bus Corridor:
Requires significant performance, safety and service quality enhancements

Guadalajara BRTS:
Requires minor implementation adjustments and a continuous quality improvement program

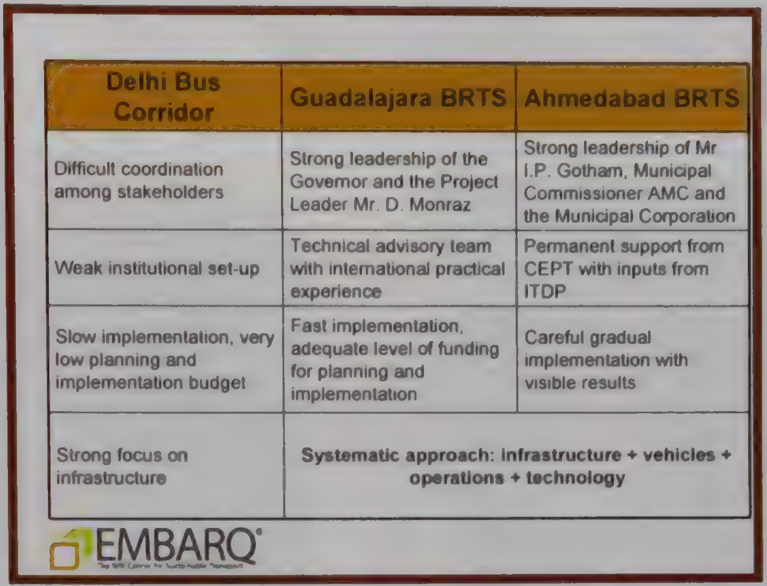
Janmarg Ahmedabad, India



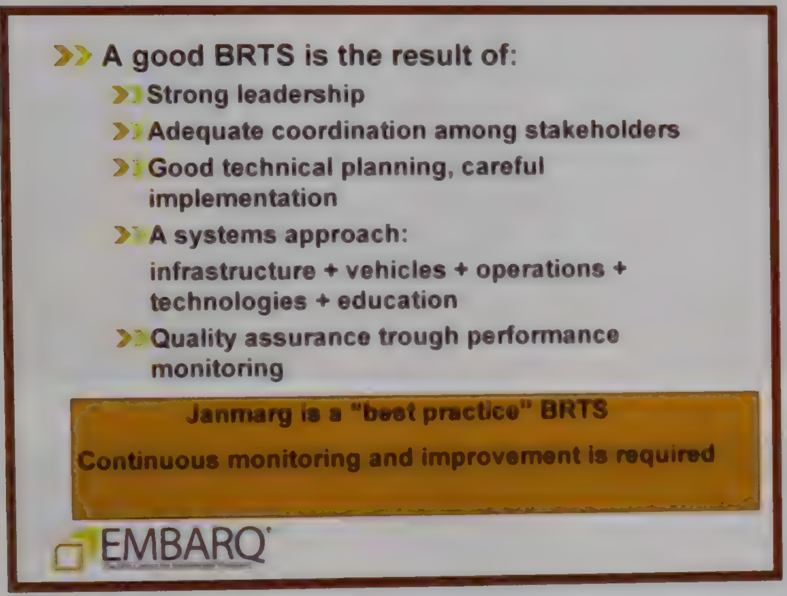
Component	Advances	Elements to improve
Running Ways	• Strong longitudinal segregation • Median Busways • Good pavement structure	• Completing details • Careful maintenance • Promote bike track use
Traffic Engineering	• Adequate Changes in Roadway Geometry	• Complete pedestrian crossing in far side of stations • Complete traffic signal implementation (expected)
Stations	• Median station, good design • Enclosed facilities, glass doors • Level Boarding and Prepayment • Accessible	• Narrow entry/exit • Complete interior details and signage • Install turnstiles and ticketing • Careful maintenance • Manage interior flow of passengers
Vehicles	• Renewed fleet (can be better at a cost) • Easy Boarding/Alighting - 1 wide door	• Continue drivers' training • Careful maintenance
Services	• Frequent services	• Adjust service plan to travel needs
ITS	• Yet to complete implementation	• Fare collection • Central control and dispatch • Variable message signs at stations



Component	"High End" BRT
Quality of Service	• High User Acceptance
Travel Time	• Easily Accessible • Low waiting time • High commercial speed
Reliability	• Low variability (intervals, speeds) • Low breakdowns, incidents
Comfort	• Low Occupancy Levels (buses, platforms) • Good user information • Seamless integration with other transport modes • Perception of safety and security
Cost	• Relative low capital and operational costs • High capital and operational productivity
Externalities	• Low level of accidents (fatalities, injuries) • Low emissions • Congestion relief (attraction of personalized vehicle users) • Increased land values



Delhi Bus Corridor	Guadalajara BRTS	Ahmedabad BRTS
Difficult coordination among stakeholders	Strong leadership of the Governor and the Project Leader Mr. D. Monraz	Strong leadership of Mr I.P. Gotham, Municipal Commissioner AMC and the Municipal Corporation
Weak institutional set-up	Technical advisory team with international practical experience	Permanent support from CEPT with inputs from ITDP
Slow implementation, very low planning and implementation budget	Fast implementation, adequate level of funding for planning and implementation	Careful gradual implementation with visible results
Strong focus on infrastructure	**Systematic approach: infrastructure + vehicles + operations + technology**	

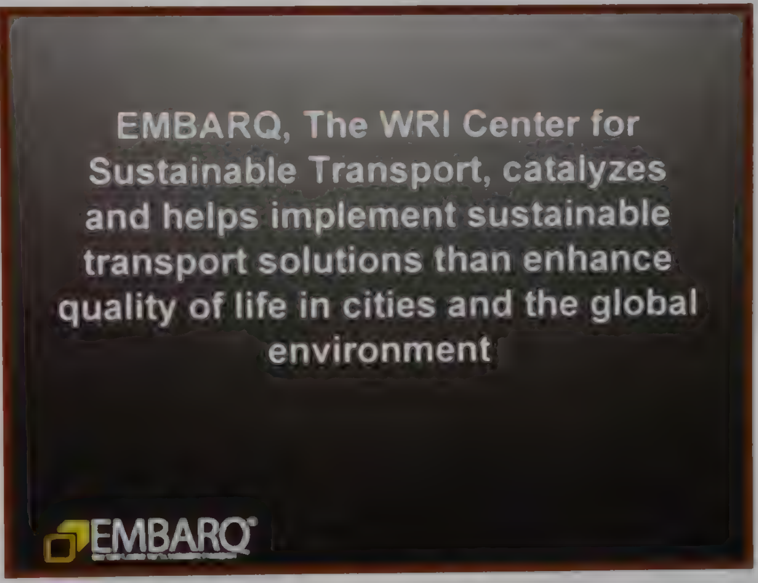


A good BRTS is the result of:

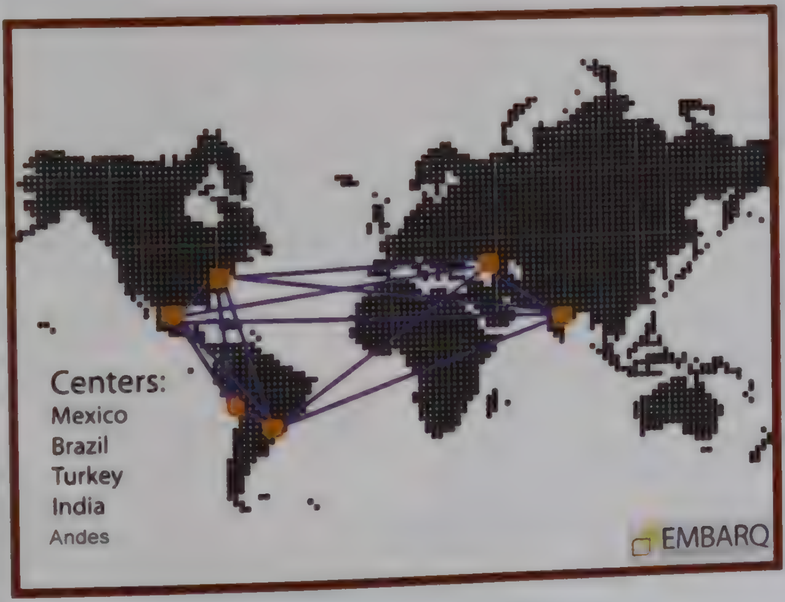
- **Strong leadership**
- **Adequate coordination among stakeholders**
- **Good technical planning, careful implementation**
- **A systems approach:**
  infrastructure + vehicles + operations + technologies + education
- **Quality assurance trough performance monitoring**

Janmarg is a "best practice" BRTS

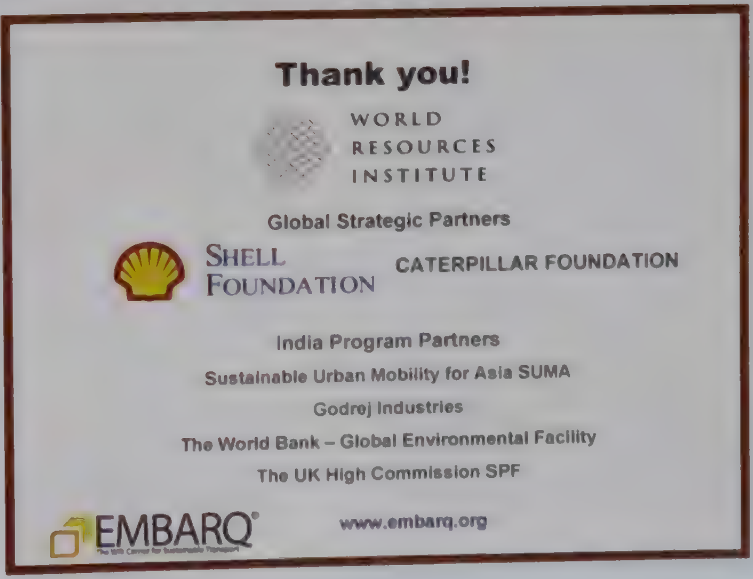
Continuous monitoring and improvement is required



EMBARQ, The WRI Center for Sustainable Transport, catalyzes and helps implement sustainable transport solutions than enhance quality of life in cities and the global environment



Centers:
Mexico
Brazil
Turkey
India
Andes



Thank you!

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Godrej Industries

The World Bank – Global Environmental Facility

The UK High Commission SPF

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7. Photographs

Welcome address by Director , DULT

Shri Mohammed Mohsin, IAS

Invited speakers

Inauguration of lamp

Address by chief guest

Shri.S.Shankaerlinge Gowda, IAS ,
Secretary, Transport, Govt. of Karnataka

Shri Subir Hari Singh, IAS,
Principal Secretary, Urban Development Dept,Govt. of Karnataka

Presenting bouquet

Technical session

Shri Gaurav Gupta, IAS

Dr. Ashish Verma, CISTUP

Valedictory Session

L to R : Dr.Dario Hidalgo, Prof. Shivanand swamy, Dr A Ravindra, Sri Syed Zameer Pasha, Sri Praveen Sood

Distribution of participation certificates

Shri. A. Ravindra Advisor to Hon. CM – Urban Affairs, Govt. of Karnataka

Organizing team

Front Row : L to R : Sooryanarayana B, Nawaz N, Mohammed Khalandar Khan, Revanna R, Mohammed Mohsin, Hafeez H.A, Nandita Gupta, Anantha Lakshmi P, Ravichandra
Back Row: L to R : Adharsh, Shamala, Ashwini, Asha, Mallikarjun

8. Comments from CISTUP

Dr. Ashish Verma, Associate faculty of CiSTUP, IISc Bangalore presented the views and comments of CiSTUP on "BRTS on ORR – Comments from CiSTUP". First and foremost, he expressed full concurrence and support of CiSTUP in implementation of BRTS in Bangalore, which is aimed at encouraging sustainability in transport and providing better services to the commuters.

However, Dr. Verma highlighted few issues that need to be taken care before implementation of BRTS like; proper planning (taking systems approach), integration with other public transport modes, well designed feeder services, due provisions for NMT and disabled accessibility. In the following sections, the issues and its corresponding comments/suggestions from CiSTUP, as presented by Dr. Verma, are reported.

Proposal of BRT on Outer Ring Road

The benefits of BRTS are realized only in a fully networked and integrated system.

Benefits are realized only when there is mode shift of choice riders from private mode to public transport mode.

Since a user always tries to optimize his/her generalized cost of travel, the planning of proposed BRT system should take care of this fact.

A BRTS will be successful only when it tries to optimize the complete origin-destination (OD) travel time of a user through a networked and integrated system.

Presently, there is lack of connection between the Byappanahalli Metro Terminal Station and the proposed ORR BRTS corridor. This needs to be taken care

appropriately otherwise such discontinuities will affect actual ridership on both metro and BRTS.

It is necessary to develop a complete master plan of BRTS and may be implement the same in phases instead of trying to gauge the success of BRTS through a pilot project. BRTS on ORR could be one of the phase

The full benefits of BRTS will be realized only when all the phases have been implemented and it is completely integrated with other PT system. False expectations of success should be avoided till then.

Criteria for the Proposal

As mentioned in the data provided by DULT, the ROW is available and there is no need for the land acquisition, and therefore, it is best suitable for the implementation of BRT .

Primary criteria for prioritizing BRTS corridor should be ridership and not land availability, which may be taken as the secondary criteria.

The busy routes identified through ridership estimates basically represent the desired shortest paths of users and therefore should not be overlooked while planning a system like BRTS (with fully networked and integrated system). After all, the investment on the BRTS should be viable to the extent possible for the operator.

Feeder Services

Provision and proper design of feeder services have to be made at least for all those BRTS stops that are major trip generators or attractors.

This is important to provide the full coverage of OD travel time (i.e. last mile connectivity)

Based on; identification of catchment area, and ridership estimates, suitable feeder system should be designed for all stops.

Provision for Bi-cyclists

Park and ride facility for secured parking of bi-cycles at stops should be provided, particularly at those stops that are close to home side of trips i.e. close to residential areas.

9. Valedictory address by Shri.A.Ravindra IAS Retired, Advisor to Hon.CM – Urban Affairs, Govt. of Karnataka

Ladies and Gentlemen,

I believe you had a long day but nevertheless very useful and fruitful, tropical subject . In Bangalore we keep talking about traffic problems that are increasing everyday. I remember in 1981 the population of Bangalore was 2.9 million, today the vehicular population in Bangalore is 3.5 million ,so we see how the number of vehicles in Bangalore has been increasing so rapidly. Well I think there are a number of issues pertaining to present transport as such and I hope that they all are discussed. At the time I feel very fortunate in having Mr. Hidalgo to come and make presentation on various experiences of Western 3 cities two Indian cities Ahmadabad and Delhi .

Nevertheless I think today's focus is on BRT and let me say one thing right here that public transport is a priority for the Government of Karnataka and Bangalore particularly. So towards this end we have been striving to improve Bus transport system in this city and I think the last few years it has been a spectacular results and BMTC (Bangalore Metropolitan Transport Corporation) ranks as No. 1 in the country. Certainly I think the comfort level for travelling of buses are improved and better quality of buses and better planning are available. I would suggest both MD ,BMTC and the Commissioner Traffic would like to take up Hosur Road and the there is already road where you both should put your hands together and come up with a plan. Of course the CTTP says to have a system in the outer ring road about 190 kms but I think we will certainly make to have a plan because it is not just a plan. Mr.Hidalgo discussed so many other factors we need such as successful technology, financing, and of course management. And I think

Road Safety Issues

As per the data provided by DULT, the traffic speed along the proposed BRT corridor varies from 16 to 49 Kmph during morning peak, 20 to 48 Kmph during evening peak and 25 to 55 Kmph during off-peak. Also, the cross pedestrian facilities are planned through at-grade signalized crossings at average bus stop spacing of 1.2 km (25 proposed bus stops).

ORR is a major arterial of the city which is also designed for higher speeds, fast mobility.

A lot of through traffic, trucks etc. exists on the corridor.

Vehicles can easily reach speeds of 80 kmph on certain sections and during certain hours of the day.

The proposed design more-or less maintains the same number of lanes for private vehicles.

In such conditions, providing at-grade pedestrian crossing could prove to be a safety hazard for pedestrians and BRTS users. Also, ORR will loose its functionality as it is meant for fast movement of through and goods traffic, which will be hampered due to frequent at-grade pedestrian crossings at an average interval of 1.2 kms.

Therefore, full grade separation of pedestrians and vehicles is absolutely necessary for BRTS corridor on roads such as ORR, which falls into the category of major arterials. After all, human life cannot be compromised for costs.

This can be done by partially depressed subways with only ramps by partial elevation of road sections, which will also be completely disabled friendly.

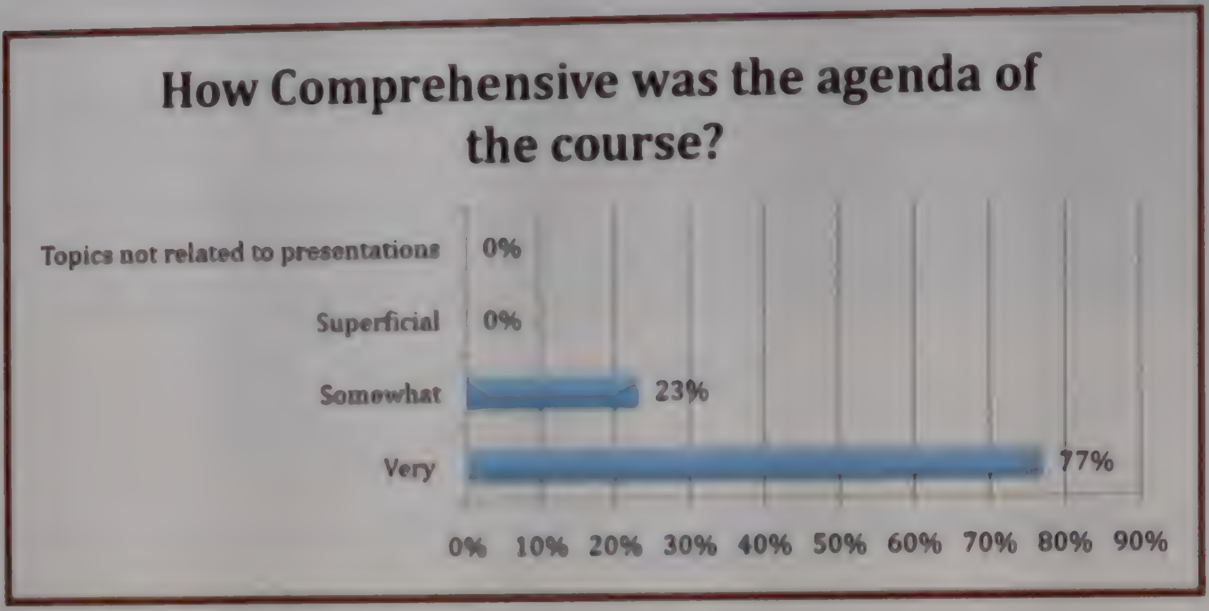
in Bangalore we have being trying to put all these things together. Coordination that is the most important lesson that's to be learnt from Delhi. Ahmadabad has a certain coordinated and unified system of government at the city level which makes it easy. Ahmadabad Municipal cooperation also has a BRT. So managing both roads infrastructure and transportation is much better, Bangalore also has a good coordinated metabolism and it should be possible by us to persuade. I think we must stop using soft bullets. We must decide that we want BRT and Have it.

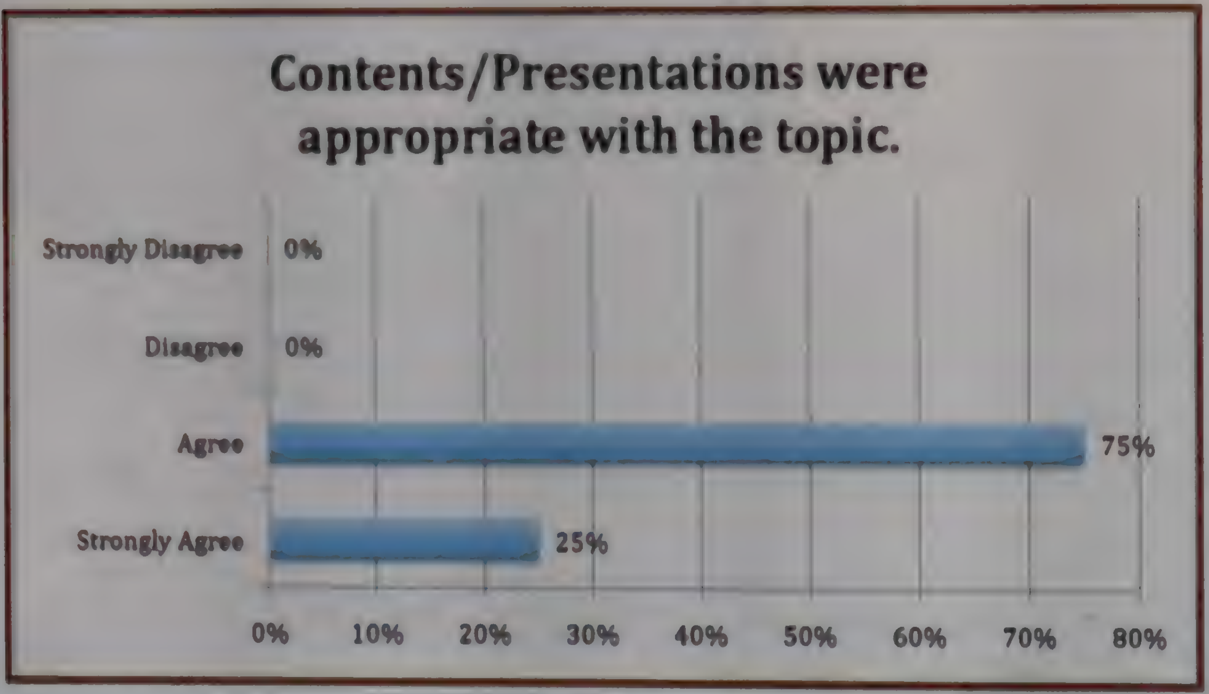
And I do put forward to the support of EMBARQ. Hidalgo and team has already shown results can be achieved in Ahmadabad, Pune and I think the next is destination must be Bangalore. We would look forward for the support and I have hope that starting BRT is one of clean and clear outcome of this workshop.

Thank you

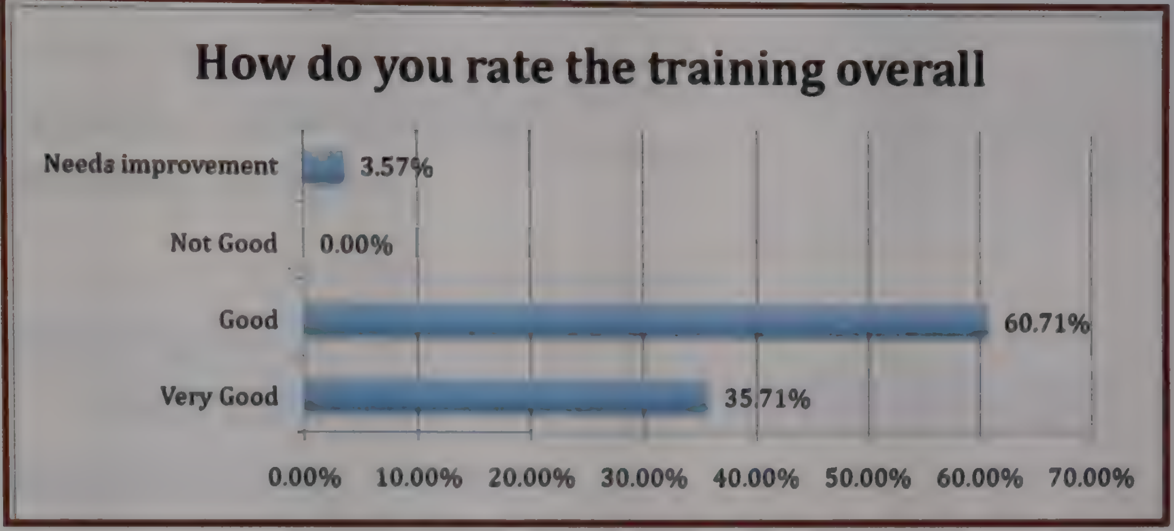
10. Evaluation/Comments from the Participants

At the end of the training course, the participants were requested to evaluate/ comment on the training course with suggestions, if any.

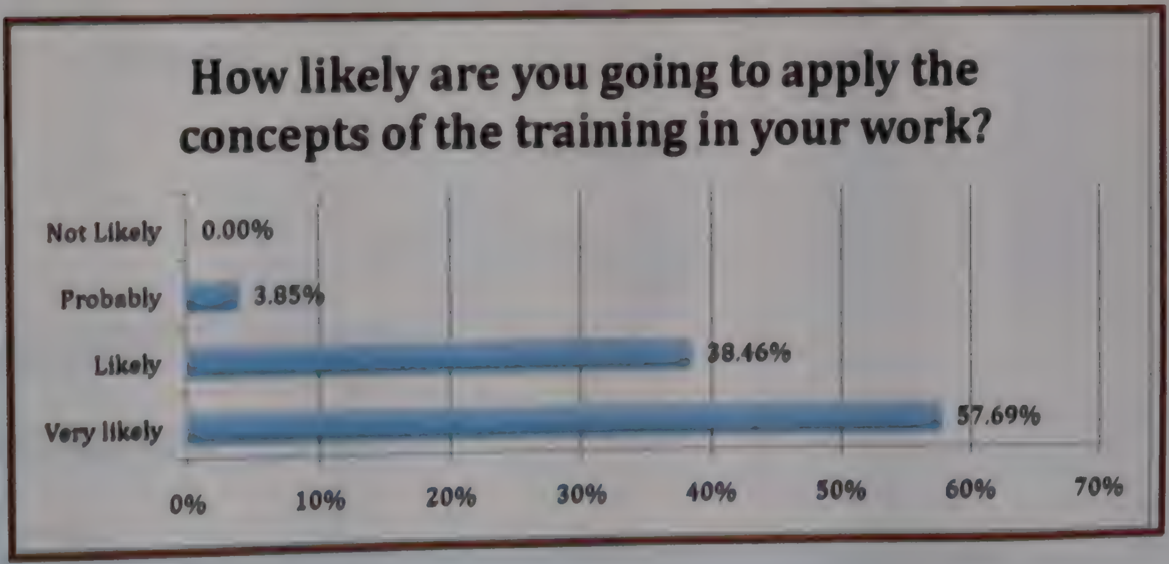




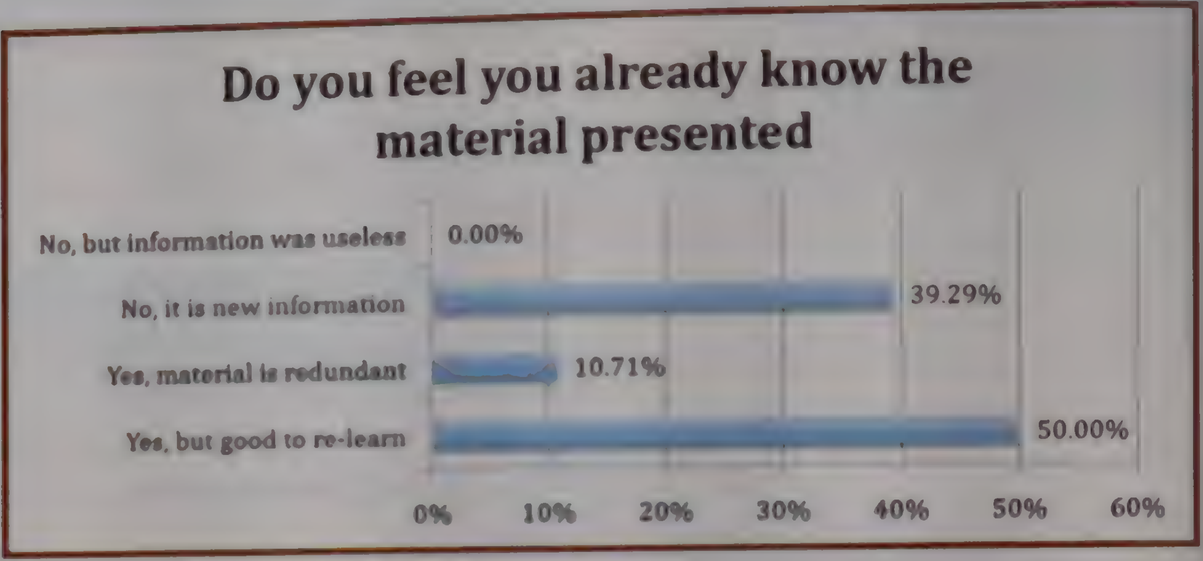
Majority of the participants responded saying that the course agenda was "Very Comprehensive" and majority of the participants agreed that the contents of the workshop were appropriate.


How do you rate the training overall

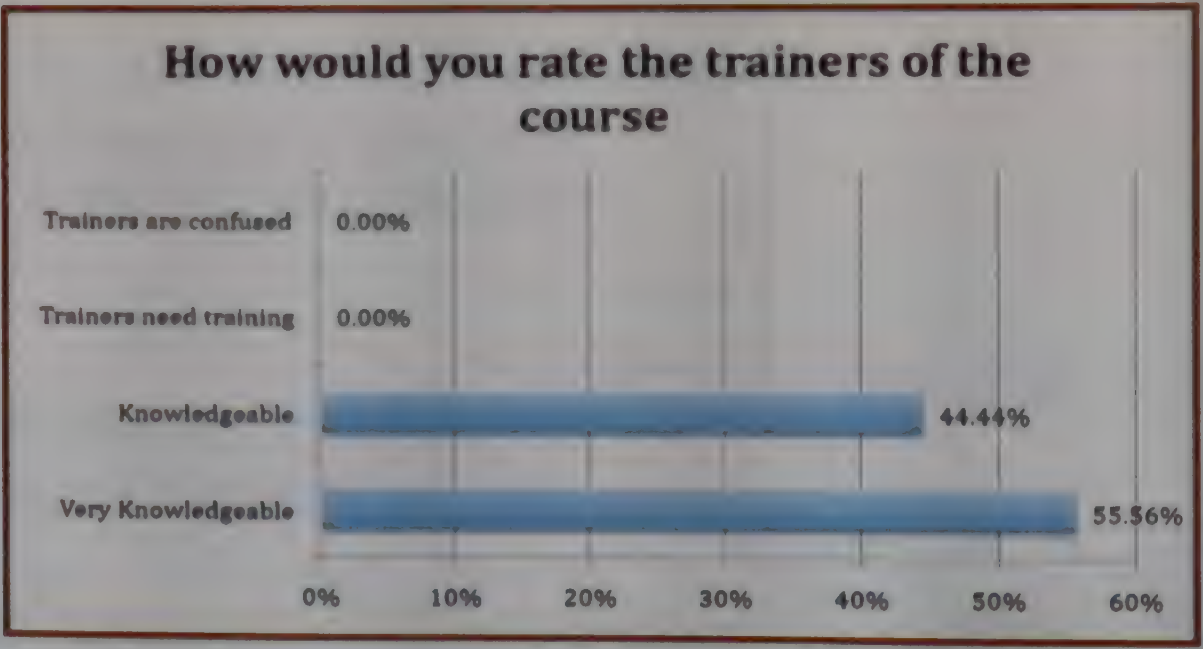
Majority of the respondents are "Very Likely" to apply the concepts from the course in their work only a very small percentage responded that they would "probably" apply the concepts. None of the participants responded to saying that they will "not likely" apply the concepts.


How likely are you going to apply the concepts of the training in your work?

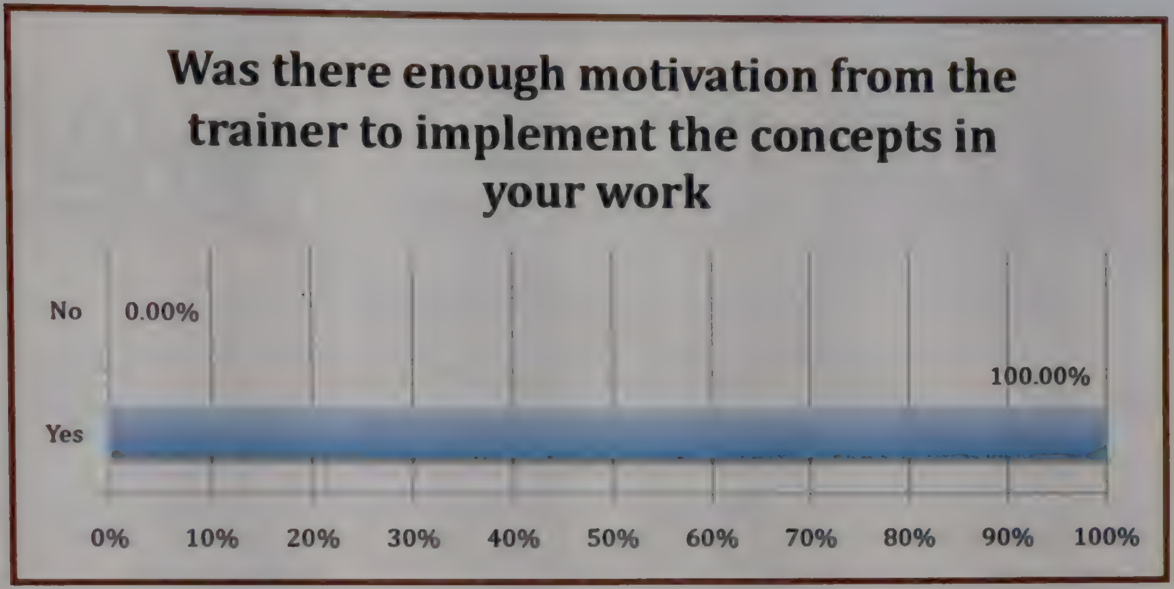
There was a very small percentage of participants who suggested that the overall training needs improvement and this improvement has to be in terms of using more country specific examples.



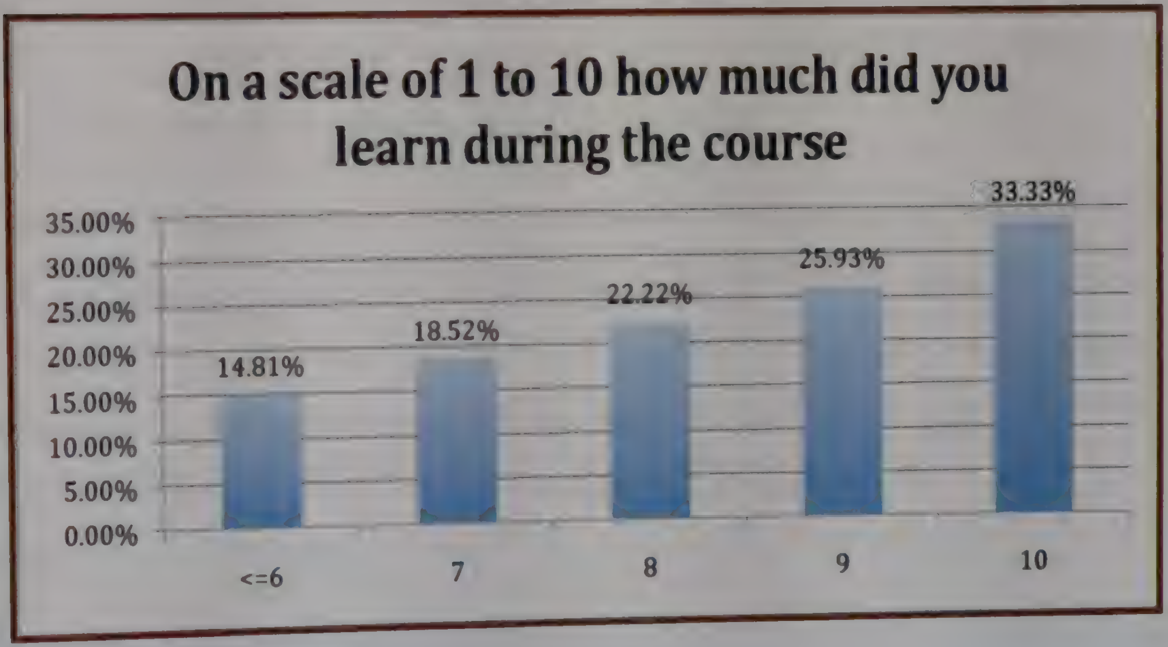
Majority of the respondents already knew the material that was being presented but they were satisfied to "re-learn" the concepts while large number of participants felt that the information being presented is new to them.



More than half of the respondents felt that the trainers are "Very Knowledgeable" in the area that they are presenting. None of the respondents felt that the trainers are either "confused" or are "untrained" for conducting the course.


Was there enough motivation from the trainer to implement the concepts in your work
No
0.00%
Yes
100.00%
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

All the respondents in the workshop believe that they are motivated after the training to apply the concepts in their work.



Majority of the respondents feel that the course was best conducted.

ANNEXURE A: CURRICULUM VITAE OF EXPERTS

Dr Dario Hidalgo (Speaker)

Dr. Dario Hidalgo is Senior Transport Engineer at EMBARQ, the World Resources Institute Center for Sustainable Transport.

He is a civil engineer from Universidad de los Andes in Bogotá, Colombia, and holds a Ph.D. in transportation planning from The Ohio State University. He has spent the last 20 years in the field of urban transport, working both as a government official and a consultant for various international agencies and local governments. He has advised cities and has led training courses on planning and implementation of BRT systems in Asia, Africa and Latin America.

An important experience in his extensive career was his participation in the planning and implementation of TransMilenio, the advanced Bus Rapid Transit system of Bogotá, Colombia, now moving over 1.6 million passengers per day. Dr. Hidalgo was member of the board of directors and deputy general manager during the implementation of TransMilenio Phase 1 (81 km), and the planning of its second phase (82 km). He then participated in the planning of the bus systems of Lima (Peru), Santiago (Chile), Accra (Ghana) and Oaxaca (Mexico), and provided input to BRT projects in Bangkok (Thailand); Dar es Salaam (Tanzania); Lagos (Nigeria); Cape Town and Johannesburg (South Africa); Pereira, Cali and Bucaramanga (Colombia); Maracaibo (Venezuela); Istanbul (Turkey); Mexico City, Guadalajara and Chihuahua (Mexico) and Arequipa (Peru). He has also conducted evaluations for the bus corridors in Pune and Delhi, and the BRT in Ahemedabad.

In his hometown of Bogotá, he was a graduate lecturer in urban transportation planning at Universidad de Los Andes. Hidalgo is the author of more than 35 articles, including a comprehensive review of bus systems in developing countries.

Prof. Shivanand Swamy

Prof. Shivanand Swamy is a postgraduate in Economics and urban and regional planning, and has completed advanced courses in transport and planning from the IIM, Bangalore and the University of Birmingham. He has 27 years of teaching, research and professional consultancy experience, and has been the guide to over 100 Master's thesis.

He has been leading multidisciplinary projects in the areas of urban transport planning, urban and regional planning, urban environment, land and housing. His strength is his strategic and programmatic skills which are reflected projects definition of transport policies and, design and implementation of the Bus Rapid Transit Systems Cities in Gujarat. He was also instrumental in the design of an urban development program for eight north-eastern states of India and the urban development policy for Gujarat.

He is one of the principle resource persons on urban and regional development issues for the State of Gujarat and has led multi-disciplinary teams for projects supported by donors such as the World Bank, ADB, UNDP and State and Local Governments in India. As an administrator of CEPT, Prof. Swamy was instrumental in upgrading CEPT an autonomous institute to that of a University.

Madhav Pai

Madhav Pai, is a Civil Engineer from Mumbai, holds a Master's Degree in Transport Planning from University of California Berkeley. Over the last ten years he has participated in several complex and innovative transport projects as a researcher, consultant and trainer. As technical director India he has been managed EMBARQ's involvement in BRT and city bus system projects in cities of Indore, Pune and Colombo and capacity building initiatives with the Ministry of Urban Development, the World Bank and the British High Commission. His work on progress of BRT projects under implementation in 5 Indian Cities and his analysis on the Urban Transport situation for 12 Indian Cities have been recently published.

Prior to joining EMBARQ he was Regional Director at Citilabs, a transport planning Software Company and headed operations in South and South East Asia. He supported all activities in the region including program development and technical support. He has delivered training courses on Transport Modeling in India, Hong Kong, Thailand, Malaysia and USA. In the San Francisco Bay Area, he spent four year working at Dowling Associates Inc. managing and executing several transport planning, transport modeling and traffic engineering project and two years as a researcher at the Institute of Transport Studies at UC Berkeley, where he was involved in assessing the short and medium term impacts of City Car Share on travel behavior in the City of San Francisco. In summer of 2006, he participated in the early conceptualization and design of an open source multi-disciplinary MIS/GIS platform and design of the Bangalore Traffic Information System (BTIS), www.btis.in at Mapunity a social development start-up in Bangalore.

Shreya Gadepalli

Shreya Gadepalli is a Senior Program Director with the Institute for Transportation and Development Policy (ITDP), and manages programs in India. She previously served the organization in the role of Technical Director for BRT and NMT projects in Asia and Africa. She has been working with ITDP for well over a decade on various projects promoting sustainable transport.

Ms Gadepalli has been a principal member of BRT program in India. In association with CEPT University's BRT team, she was closely involved in planning, design and implementation of Ahmedabad Janmarg BRTS. Janmarg BRTS is now regarded as a best practice and recently received the Prime Minister's award for 'Best MRT system' in the country. She has presented at various workshops on BRT organized by Institute of Urban Transport (IUT) and Ministry of Urban Development (MoUD), Government of India. Ms Gadepalli is one of the principal trainers of GTZ organized MRT training program in India to train other trainers.

In the late 90's, Ms Gadepalli lead the highly successful India Cycle Rickshaw Improvement Project, an ITDP initiative. The new designs have been adopted as the norm by rickshaw manufacturers in many cities of North India and more than 300,000 of these modern rickshaws are on road as of date, improving air quality levels by diverting motorized trips to an efficient non-motorized mode and providing livelihood to over a million people.

Ms Gadepalli received her Bachelor's degree in Engineering followed by a Master's in Industrial Design from the Indian Institute of Technology, Delhi.

Sonia Kapoor Arora

Sonia kapoor arora is Employee of UMTC (Joint Venture of Ministry of Urban Development (MoUD), APSRTC and ILFS) working on various urban transport projects like CMP, BRTS, Transport modeling etc. Official Trainer of GTZ on Mass Transit Systems .Earlier worked with IUT as a Senior Transport Specialist and major projects handled were on ADB Toolkit Guidelines for Comprehensive Mobility Plan, Feasibility Study on High Capacity Bus Rapid Transit & Bus Service improvement policy.she has worked on Technical Appraisal of CMPs, BRT, DPR etc for Urban Transport Division, MoUD. Also worked with TRIPP, IIT on various urban transport projects like Feasibility study of High Capacity Mass Transport System for Pune Metropolitan Area, Transport modelling of BRTS projects etc.

Mr. Santhosh Kodukula

Mr.Santhosh Kodukula, has completed his masters in Environmental management from Mahidol University, Thailand. His specialisation in masters was Urban and Regional Planning with focus on Transport planning and management. His thesis was aimed towards finding the benefits for pedestrianisation in a city. Since, 2006, he has been working with the GTZ-Sustainable Urban Transport project providing assistance to all project activities, especially in the development and delivery of training courses. Santhosh contributed to the course by arranging the logistics with the future trainers, delivering a presentation on modal integration and also providing feedback on discussions.

ANNEXURE B: LIST OF PARTICIPANTS

ORGANIZERS

- Sri Mohammed Mohsin IAS, Director, DULT
- Sri H A Hafeez, Special officer, DULT
- Smt Nandita Gupta, Administrative officer, DULT
- Sri B Sooryanarayana, Executive Engineer, DULT
- Sri R Revanna, Transport Planner, DULT
- Smt P Anantha Lakshmi, Transport Planner, DULT
- Sri Mohammed Khalander Khan, Transport Planner, DULT
- Sri N Nawaz, Traffic Engineer, DULT

CHAIRPERSONS

- Sri Subir Hari Singh IAS, Principal Secretary, Urban Development Department
- Sri V Madhu IAS, Principal Secretary, Infrastructure Development Department
- Sri Shankarlingegowda IAS, Secretary, Transport Department
- Sri Gaurav Gupta IAS, Managing Director, KSRTC, Bangalore
- Sri Syed Zameer Pasha IAS, Managing Director, Bangalore Metropolitan Transport Corporation
- Sri Praveen Sood IPS, Additional Commissioner of Police (Traffic)
- Sri N Sheshadri, Senior Transport Planner, Wilbursmith Associates
- Sri Sivasailam IAS , Managing Director, BMRCL
- Prof C E G Justo, Prof (Civil Engineering), Bangalore University

SPEAKERS

- Dr Dario Hidalgo, Embarq
- Ms Shreya Gadepalli, ITDP
- Prof Shivanand Swami, CEPT University, Ahmedabad
- Sri Madhav Pai, Embarq
- Ms Sonia Kapoor, UMTC & IUT
- Sri Santosh Kodukula, SUTP

DELEGATES

- Sri Sivasailam IAS, Managing Director, BMRCL, Bangalore
- Sri P Vastrad, IAS, Commissioner, Hubli-Dharwar City Corporation
- Sri M N Reddy, IPS, IGP, Commissioner of Police, Bangalore
- Sri M A Saleem, IPS, Director, (Vigilance), KSRTC, Bangalore
- Sri Arun CHakravarti, IPS, Director, BMTC, Bangalore
- Sri A N Raju, KAS, Commissioner, Bellary Urban Development Authority, Bellary
- Sri R Lokanathan, Assistant Executive Engineer, Bellary City Corporation, Bellary
- Sri Khaji Khaja Hussain, Junior Engineer, Bellary City Corporation, Bellary
- Sri L R Nayak, Superintend Engineer, Hubli-Dharwar Municipal Corporation
- Sri Shashikumar, Town Planning Member, Hubli Dharwar Urban Development Authority, Hubli
- Sri R S Nayak, Chief Engineer, Belgaum City Corporation, Belgaum
- Sri Ragupal G, Junior Engineer, Mangalore City Corporation, Mangalore
- Sri P P Dhane, Town Planning Member, Gulbarga Urban Development Authority, Gulbarga
- Sri C G Anand, Chief Mechanical Engineer, KSRTC, Bangalore
- Sri Rajkumar, Director (Operations), KSRTC, Bangalore
- Sri Channabasappa, Chief Manager, KSRTC, Bangalore
- Sri T G Kempananjaiah, Works Manager (RWB), KSRTC, Bangalore
- Sri G Prakash, Chief Traffic Officer, KSRTC, Bangalore
- Sri M N Srinivas, Divisional Controller, KSRTC, Mysore
- Sri P Ashokkumar, Chief Traffic Manager, NWKRTC
- Sri K S Vishwanath, Chief Traffic Manager, BMTC, Bangalore
- Sri B G S R Gowda, Deputy Traffic officer, BMTC, Bangalore
- Smt Mithila Jha, Urban Transport Consultant, BMTC, Bangalore
- Sri M B Mukkanna, Chief Mechanical Engineer, BMTC, Bangalore

- Sri G N Veeregowda, Chief Traffic Manager, BMTC, Bangalore
- Sri N A Khan, Deputy Traffic Officer, BMTC, Bangalore
- Sri Mahendra, Additional Director, BMRDA, Bangalore
- Sri Srinivas R, Engineering Member, BDA, Bangalore
- Sri Thyagaraj, Engineer officer, BDA, Bangalore
- Sri Sanjeev Maraddi, Superintend Engineer, BDA, Bangalore
- Sri Nanjundappa, Engineer officer, BDA, Bangalore
- Sri Nagaraj Murthy H B, Executive Engineer, BDA, Bangalore
- Sri G S Madhuranath, Assistant Executive Engineer, BDA, Bangalore
- Sri J A Nagaraj Reddy, Executive Engineer, BDA, Bangalore
- Sri M anjunath, Executive Engineer, BDA, Bangalore
- Sri Prakash, Executive Engineer, BDA, Bangalore
- Sri Basavaraj Kabade, Executive Engineer, BBMP, Bangalore
- Sri T N Chikkarayappa, Chief Engineer (North), BBMP, Bangalore
- Sri M V Prakash, Assistant Director, Town Planning, Bangalore
- Sri M A Sreenath, Assistant Director, Town Planning, Bangalore
- Smt Monika Kashkari, Deputy Director, (Town Planning), KUIDFC, Bangalore
- Sri Shankar Patil, NEKRTC
- Sri S B Honnur, Additional Director, BMICAPA, Bangalore
- Sri Shivananda, Deputy Chief Engineer, BMRCL, Bangalore
- Dr Ashish Verma, Asst Prof (Dept of Civil Engineering) & Associate Faculty CiSTUP , Bangalore
- Sri Srinivasa, Research Assistant, CISTUP, Bangalore
- Sri Deepark, Research Assistant, CISTUP, Bangalore
- Ms Nibedita Dash, Ph.D Student, CISTUP, Bangalore
- Sri Sridhar Samanth, Student, CISTUP, Bangalore
- Sri Jaffer Sharief, BCCF, Bangalore
- Sri Pradeep S, Mobility Associate BCCF, Bangalore
- Sri Ramachandra Naidu, Member of Advisory Board Committee
- Prof T V Ramanaiah, Professor, IIMB, Bangalore
- Prof Ashwin Mahesh, IIMB, Bangalore
- Sri Andrew, Member Project Consultant, Institute of Engineer
- Sri U Kumar, Associate Professor, Bangalore University, Bangalore
- Sri Rahul Singh, Country Director, Embark
- Smt Niyati Tandon, ICRA, Bangalore
- Sri Nagaraj

- Sri Vinay, CSTEP
- Sri Ravikumar M R, Business Development
- Team Leader, GTZ

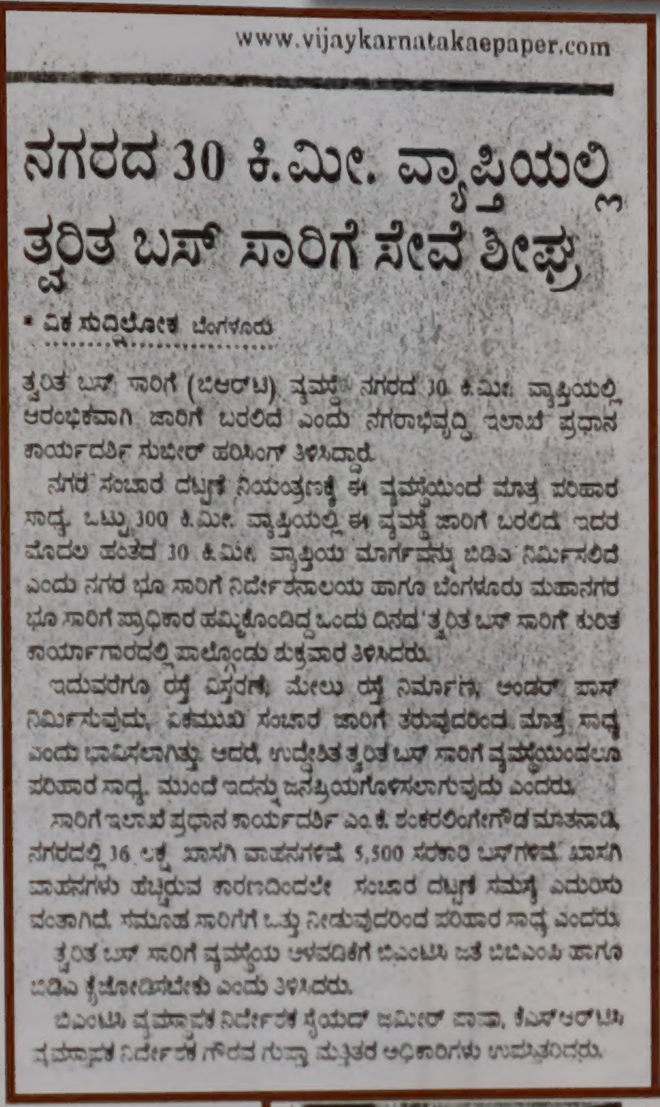
PRESS AND MEDIA FRIENDS

- Times of India, Bangalore
- Doordarshan Kannada, Bangalore
- ETV, Bangalore
- Indian Express, Bangalore
- Vijaya Karnataka, Bangalore
- Esanje, Bangalore
- Mussanje, Bangalore
- Bangalore Mirror, Bangalore
- KF Channel, Bangalore
- Dinamalar, Bangalore
- Sanjevani, Bangalore
- Abhimaani Group, Bangalore
- Udayavani, Bangalore
- Dinakara, Bangalore
- Karnataka Photo News, Bangalore
- Rajasthan Patrika, Bangalore
- Lokmath News Paper
- Kannada Suddhi, Bangalore
- Times Lokmath
- Vaartha,Bangalore

SUPPORTING STAFF

- Adharsh.V
- Subramaniyam.M
- Balakrishna.N
- Asha
- Ashwini.R
- Mallikarjun.N
- Jeeva Rathna.L
- Shamala.P
- Yogalakshmi

ANNEXURE C : PRESS CLIPPINGS



www.vijaykarnatakaepaper.com

ನಗರದ 30 ಕಿ.ಮೀ. ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ತ್ವರಿತ ಬಸ್ ಸಾರಿಗೆ ಸೇವೆ ಶೀಘ್ರ

• ವಿಕ ಸುದ್ದಿಲೋಕ ಬೆಂಗಳೂರು

ತ್ವರಿತ ಬಸ್ ಸಾರಿಗೆ (ಬಿಆರ್‌ಟಿ) ವ್ಯವಸ್ಥೆ ನಗರದ 30 ಕಿ.ಮೀ. ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಆರಂಭಿಕವಾಗಿ ಜಾರಿಗೆ ಬರಲಿದೆ ಎಂದು ನಗರಾಭಿವೃದ್ಧಿ ಇಲಾಖೆ ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿ ಸುಬೀರ್ ಹರಿಸಿಂಗ್ ತಿಳಿಸಿದ್ದಾರೆ.

ನಗರ ಸಂಚಾರ ದಟ್ಟಣೆ ನಿಯಂತ್ರಣಕ್ಕೆ ಈ ವ್ಯವಸ್ಥೆಯಿಂದ ಮಾತ್ರ ಪರಿಹಾರ ಸಾಧ್ಯ. ಒಟ್ಟು 300 ಕಿ.ಮೀ. ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಈ ವ್ಯವಸ್ಥೆ ಜಾರಿಗೆ ಬರಲಿದೆ. ಇದರ ಮೊದಲ ಹಂತದ 30 ಕಿ.ಮೀ. ವ್ಯಾಪ್ತಿಯ ಮಾರ್ಗವನ್ನು ಬಿಡಿಎ ನಿರ್ಮಿಸಲಿದೆ ಎಂದು ನಗರ ಭೂ ಸಾರಿಗೆ ನಿರ್ದೇಶನಾಲಯ ಹಾಗೂ ಬೆಂಗಳೂರು ಮಹಾನಗರ ಭೂ ಸಾರಿಗೆ ಪ್ರಾಧಿಕಾರ ಹಮ್ಮಿಕೊಂಡಿದ್ದ ಒಂದು ದಿನದ 'ತ್ವರಿತ ಬಸ್ ಸಾರಿಗೆ ಕುರಿತ ಕಾರ್ಯಾಗಾರದಲ್ಲಿ ಪಾಲ್ಗೊಂಡು ಶುಕ್ರವಾರ ತಿಳಿಸಿದರು.

ಇದುವರೆಗೂ ರಸ್ತೆ ವಿಸ್ತರಣೆ, ಮೇಲು ರಸ್ತೆ ನಿರ್ಮಾಣ, ಅಂಡರ್ ಪಾಸ್ ನಿರ್ಮಿಸುವುದು, ಏಕಮುಖಿ ಸಂಚಾರ ಜಾರಿಗೆ ತರುವುದರಿಂದ ಮಾತ್ರ ಸಾಧ್ಯ ಎಂದು ಭಾವಿಸಲಾಗಿತ್ತು. ಆದರೆ, ಉದ್ದೇಶಿತ ತ್ವರಿತ ಬಸ್ ಸಾರಿಗೆ ವ್ಯವಸ್ಥೆಯಿಂದಲೂ ಪರಿಹಾರ ಸಾಧ್ಯ. ಮುಂದೆ ಇದನ್ನು ಜನಪ್ರಿಯಗೊಳಿಸಲಾಗುವುದು ಎಂದರು.

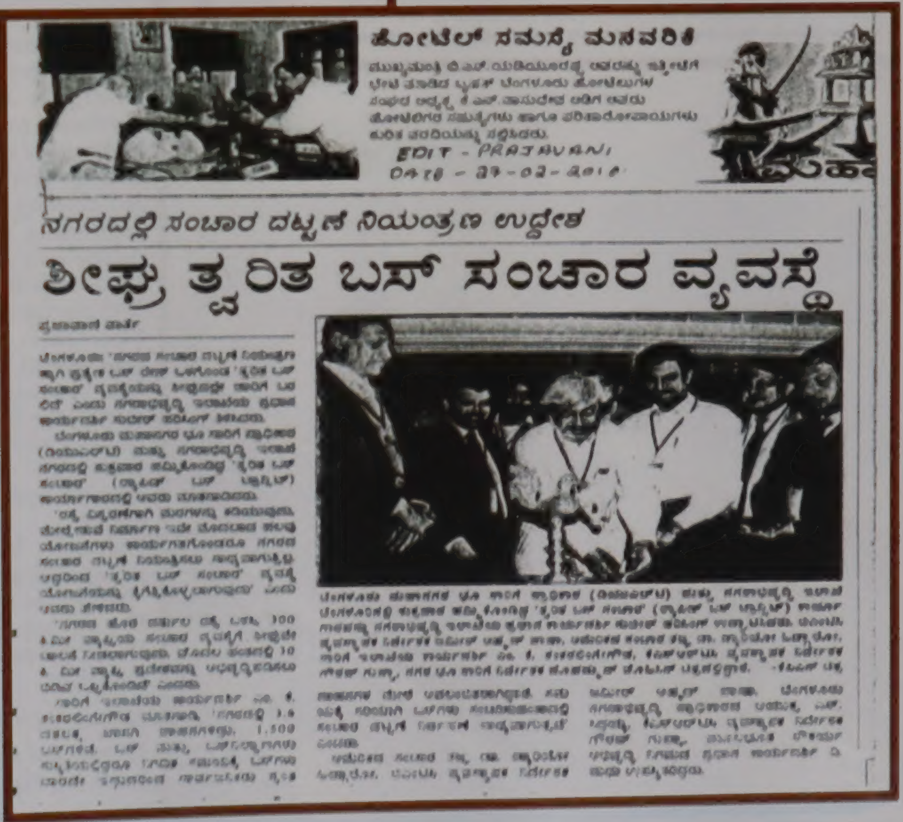
ಸಾರಿಗೆ ಇಲಾಖೆ ಪ್ರಧಾನ ಕಾರ್ಯದರ್ಶಿ ಎಂ.ಕೆ. ಶಂಕರಲಿಂಗೇಗೌಡ ಮಾತನಾಡಿ, ನಗರದಲ್ಲಿ 16 ಲಕ್ಷ ಖಾಸಗಿ ವಾಹನಗಳಿವೆ. 5,500 ಸರಕಾರಿ ಬಸ್‌ಗಳಿವೆ. ಖಾಸಗಿ ವಾಹನಗಳು ಹೆಚ್ಚಿರುವ ಕಾರಣದಿಂದಲೇ ಸಂಚಾರ ದಟ್ಟಣೆ ಸಮಸ್ಯೆ ಎದುರಾಗುವಂತಾಗಿದೆ. ಸಮೂಹ ಸಾರಿಗೆಗೆ ಒತ್ತು ನೀಡುವುದರಿಂದ ಪರಿಹಾರ ಸಾಧ್ಯ ಎಂದರು.

ತ್ವರಿತ ಬಸ್ ಸಾರಿಗೆ ವ್ಯವಸ್ಥೆಯ ಅಳವಡಿಕೆಗೆ ಬಿಎಂಟಿಸಿ ಜತೆ ಬಿಬಿಎಂಪಿ ಹಾಗೂ ಬಿಡಿಎ ಕೈಜೋಡಿಸಬೇಕು ಎಂದು ತಿಳಿಸಿದರು.

ಬಿಎಂಟಿಸಿ ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕ ಸೈಯದ್ ಜಮೀರ್ ಪಾಷಾ, ಕೆಎಸ್‌ಆರ್‌ಟಿಸಿ ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕ ಗೌರವ ಗುಪ್ತಾ ಮತ್ತಿತರ ಅಧಿಕಾರಿಗಳು ಉಪಸ್ಥಿತರಿದ್ದರು.

Vijaykarnataka

Paper



ಹೋಟೆಲ್ ಸಮಸ್ಯೆ ಮನವರಿಕೆ

EDIT - PRAJAVANI,
DATE - 27-02-2010

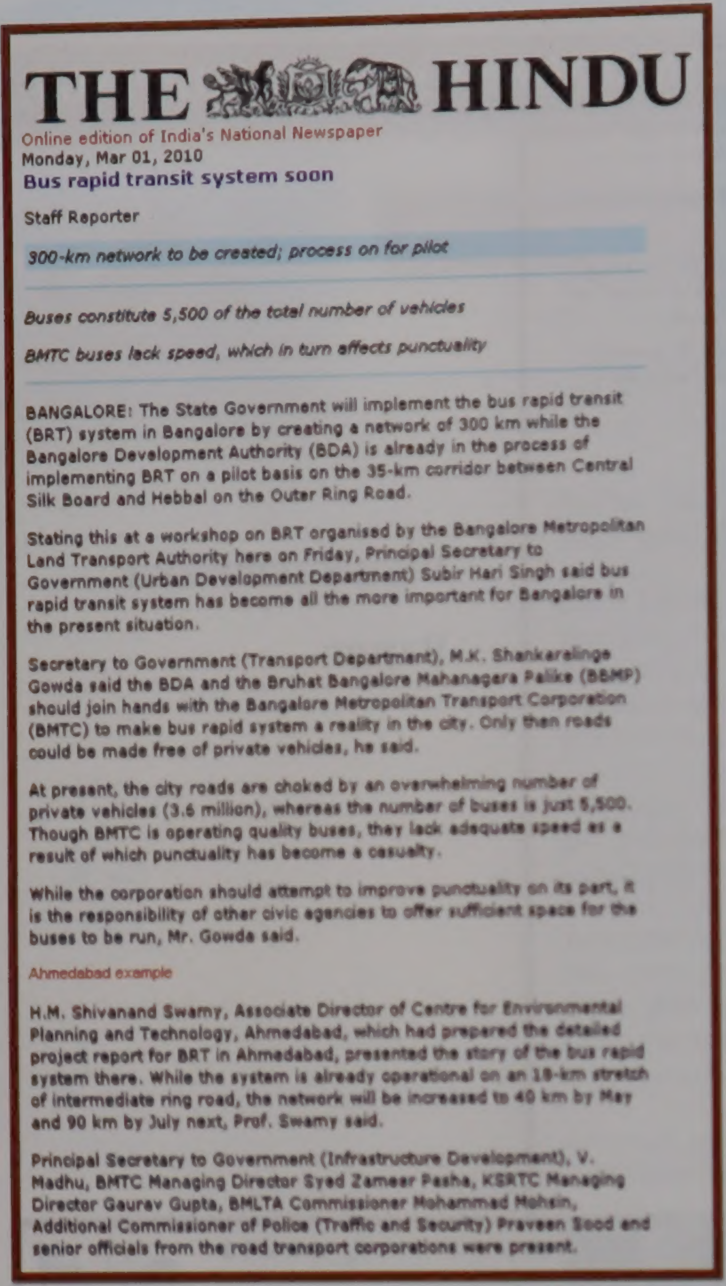
ನಗರದಲ್ಲಿ ಸಂಚಾರ ದಟ್ಟಣೆ ನಿಯಂತ್ರಣ ಉದ್ದೇಶ

ಶೀಘ್ರ ತ್ವರಿತ ಬಸ್ ಸಂಚಾರ ವ್ಯವಸ್ಥೆ

ಪ್ರಜಾವಾಣಿ ವಾರ್ತೆ

Prajavani

Paper



THE HINDU

Online edition of India's National Newspaper

Monday, Mar 01, 2010

Bus rapid transit system soon

Staff Reporter

300-km network to be created; process on for pilot

Buses constitute 5,500 of the total number of vehicles

BMTC buses lack speed, which in turn affects punctuality

BANGALORE: The State Government will implement the bus rapid transit (BRT) system in Bangalore by creating a network of 300 km while the Bangalore Development Authority (BDA) is already in the process of implementing BRT on a pilot basis on the 35-km corridor between Central Silk Board and Hebbal on the Outer Ring Road.

Stating this at a workshop on BRT organised by the Bangalore Metropolitan Land Transport Authority here on Friday, Principal Secretary to Government (Urban Development Department) Subir Hari Singh said bus rapid transit system has become all the more important for Bangalore in the present situation.

Secretary to Government (Transport Department), M.K. Shankaralinga Gowda said the BDA and the Bruhat Bangalore Mahanagara Palike (BBMP) should join hands with the Bangalore Metropolitan Transport Corporation (BMTC) to make bus rapid system a reality in the city. Only then roads could be made free of private vehicles, he said.

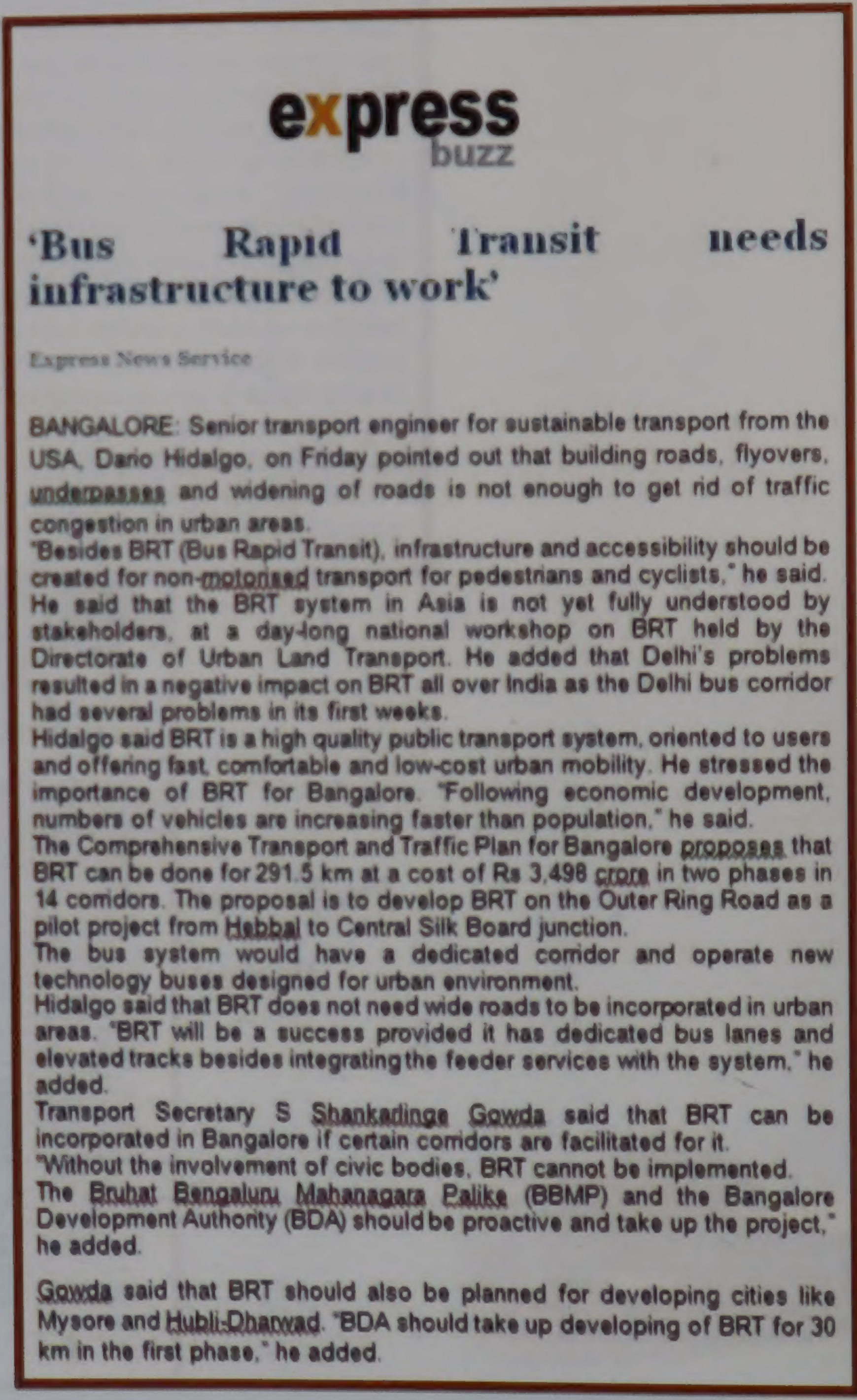
At present, the city roads are choked by an overwhelming number of private vehicles (3.6 million), whereas the number of buses is just 5,500. Though BMTC is operating quality buses, they lack adequate speed as a result of which punctuality has become a casualty.

While the corporation should attempt to improve punctuality on its part, it is the responsibility of other civic agencies to offer sufficient space for the buses to be run, Mr. Gowda said.

Ahmedabad example

H.M. Shivanand Swamy, Associate Director of Centre for Environmental Planning and Technology, Ahmedabad, which had prepared the detailed project report for BRT in Ahmedabad, presented the story of the bus rapid system there. While the system is already operational on an 18-km stretch of intermediate ring road, the network will be increased to 40 km by May and 90 km by July next, Prof. Swamy said.

Principal Secretary to Government (Infrastructure Development), V. Madhu, BMTC Managing Director Syed Zameer Pasha, KSRTC Managing Director Gaurav Gupta, BMLTA Commissioner Mohammed Mohsin, Additional Commissioner of Police (Traffic and Security) Praveen Sood and senior officials from the road transport corporations were present.



express buzz

'Bus Rapid Transit needs infrastructure to work'

Express News Service

BANGALORE: Senior transport engineer for sustainable transport from the USA, Dario Hidalgo, on Friday pointed out that building roads, flyovers, underpasses and widening of roads is not enough to get rid of traffic congestion in urban areas.

"Besides BRT (Bus Rapid Transit), infrastructure and accessibility should be created for non-motorised transport for pedestrians and cyclists," he said. He said that the BRT system in Asia is not yet fully understood by stakeholders, at a day-long national workshop on BRT held by the Directorate of Urban Land Transport. He added that Delhi's problems resulted in a negative impact on BRT all over India as the Delhi bus corridor had several problems in its first weeks.

Hidalgo said BRT is a high quality public transport system, oriented to users and offering fast, comfortable and low-cost urban mobility. He stressed the importance of BRT for Bangalore. "Following economic development, numbers of vehicles are increasing faster than population," he said.

The Comprehensive Transport and Traffic Plan for Bangalore proposes that BRT can be done for 291.5 km at a cost of Rs 3,498 crore in two phases in 14 corridors. The proposal is to develop BRT on the Outer Ring Road as a pilot project from Hebbal to Central Silk Board junction.

The bus system would have a dedicated corridor and operate new technology buses designed for urban environment.

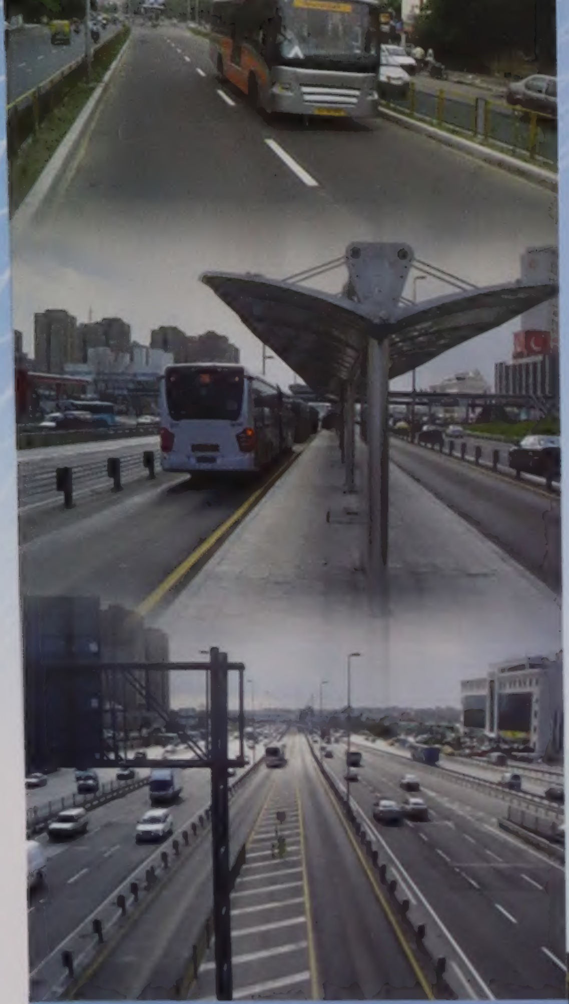
Hidalgo said that BRT does not need wide roads to be incorporated in urban areas. "BRT will be a success provided it has dedicated bus lanes and elevated tracks besides integrating the feeder services with the system," he added.

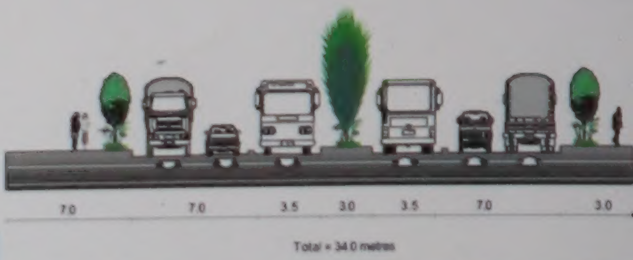
Transport Secretary S Shankarlinge Gowda said that BRT can be incorporated in Bangalore if certain corridors are facilitated for it.

"Without the involvement of civic bodies, BRT cannot be implemented.

The Bruhat Bengaluru Mahanagara Palike (BBMP) and the Bangalore Development Authority (BDA) should be proactive and take up the project," he added.

Gowda said that BRT should also be planned for developing cities like Mysore and Hubli-Dharwad. "BDA should take up developing of BRT for 30 km in the first phase," he added.





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